RADIOLOGY

A MONTHLY JOURNAL DEVOTED TO CLINICAL RADIOLOGY AND ALLIED SCIENCES

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CONTENTS

SYMPOSIUM ON CANCER OF THE CERVIX UTERI
INTRODUCTION — *A. N. Arneson, M.D.* 803

DIAGNOSIS OF CANCER OF THE CERVIX: THE EARLY LESION. — *Gerald A. Galvin, M.D.* 804

THE DISPERSION OF CANCER OF THE CERVIX. — *Erle Henriksen, M.D.* 812

THE CLASSIFICATION OF CERVICAL CANCER. — *Gerald A. Galvin, M.D.* 815

THE SURGICAL TREATMENT OF CANCER OF THE CERVIX. — *Erle Henriksen, M.D.* 819

RADIUM TREATMENT OF CARCINOMA OF THE CERVIX UTERI. — *James F. Nolan, M.D., William E. Costolow, M.D., and Lucille DuSault, A.B.* 821

ROENTGEN TREATMENT OF CANCER OF THE CERVIX. — *Gilbert H. Fletcher, M.D.* 832

DISCUSSION 843

ANGIOCARDIOGRAPHY IN CONGENITAL HEART DISEASE OF CYANOTIC TYPE. II. OBSERVATIONS ON TRICUSPID STENOSIS OR ATRESIA WITH HYPOPLASIA OF THE RIGHT VENTRICLE. — *Robt. N. Cooley, M.D., Robt. D. Sloan, M.D., C. Rollins Hanlon, M.D., and Henry T. Bahnson, M.D.* 848

A SIMPLE SERIALOGRAPHIC TECHNIC FOR CEREBRAL ANGIOGRAPHY. — *Lee S. Rosenberg, M.D., and James R. Simpson, M.D.* 869

USE OF GASTRIC MUCIN AS A BARIUM SUSPENSION MEDIUM. A PRELIMINARY REPORT. — *Gilbert H. Alexander, M.D., and Ralph E. Alexander, M.D.* 875

USE OF MICROPULVERIZED BARIUM SULFATE IN X-RAY DIAGNOSIS. A PRELIMINARY REPORT. — *William Adolph, M.D., and George V. Taplin, M.D.* 878

EDITORIAL: ROENTGEN DIAGNOSIS AND CLINICAL RESPONSIBILITY. — *Leo G. Rigler, M.D.* 884

ANNOUNCEMENTS AND BOOK REVIEWS. 886

RADIOLOGICAL SOCIETIES: SECRETARIES AND MEETING DATES. 889

ABSTRACTS OF CURRENT LITERATURE. 892

INDEX TO VOLUME 54. 927

RADIOLOGY

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Vol. 54 JUNE 1950 No. 6

Symposium on Cancer of the Cervix Uteri[1]

Chairman

A. N. ARNESON, M.D.

Participants

GERALD A. GALVIN, M.D.
ERLE HENRIKSEN, M.D.
JAMES F. NOLAN, M.D., WILLIAM E. COSTOLOW, M.D., and LUCILLE DuSAULT, A.B.
GILBERT H. FLETCHER, M.D.

Introduction

A. N. ARNESON, M.D.

St. Louis, Mo.

THE FINAL RESULT attained in treatment of carcinoma of the cervix is in no small way related to precision of the initial examination. Delay in diagnosis obviously results in impairment of prognosis. Tumors that are clinically evident present no special problem in recognition, but intelligent interpretation is essential for diagnosis of early lesions not well established.

Newer methods of study of exfoliative cytology have extended the range of diagnosis to a level that appears to be at the incipient state of tumor growth. Recognition of an *in situ* lesion presents a definite problem in classification as to stage of advance. From a statistical standpoint, it appears illogical to group pre-invasive cancers with the earliest forms of growth that can be recognized clinically.

The diagnosis of an *in situ* carcinoma also presents a problem in treatment. The usual aim of therapeutic procedures to treat adequately all of the tumor-bearing region may appear to be radical for such early lesions. In that connection, however, a word of caution seems to be in order, since experience has shown that lesions believed at first to be intra-epithelial may, on further study, prove to be invasive. The relation of diagnosis to treatment becomes more important in the case of *in situ* lesions if we are to accept a less radical method of treatment for pre-invasive cancer.

The most important factor in prognosis is the stage of clinical advance to which the tumor has grown, but differences in natural history are also responsible for variations in the clinical behavior of different cervical cancers. Tendency toward spread by lymphatic dispersion probably is greater than generally believed, and also involves a higher incidence of distant node involvement. Death from cervical cancer is, however, associated principally with more or less local effects, the urinary tract showing a preponderance of complications. The

[1] Presented at the Thirty-fifth Annual Meeting of the Radiological Society of North America, Cleveland, Ohio, Dec. 4–9, 1949.

critical problem in treatment is, therefore, the regional nodes to which metastases most frequently occur. The relative effectiveness of surgery or radiation depends upon control of those dispersions. Advance in radiation treatment would seem to depend upon greater homogeneity of irradiation and greater knowledge of normal tissue as well as of tumor tissue tolerance. Advance in surgical treatment would seem to depend upon more radical extirpation of regions likely to be involved.

The aim of this symposium is to present in an orderly fashion the problem arising with the more frequent diagnosis of preinvasive cancer, and to attempt a critical analysis of therapeutic measures in relation to the requirements to be met in adequate treatment of the local lesion as well as the normal pathways of spread for cervical cancer.

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Diagnosis of Cancer of the Cervix: The Early Lesion[1]

GERALD A. GALVIN, M.D.
Baltimore, Md.

THE MOST important factor in our ability to cure cervical cancer, in spite of the refinements of irradiation and the recent advances in surgery, still remains the stage in which the disease is detected and treated. The advanced lesion continues to be an almost hopeless problem, while the early lesion, regardless of the type of therapy, provided it be adequate, enjoys an excellent prognosis. In our present stage of knowledge, intra-epithelial carcinoma is the earliest stage in which cervical cancer permits diagnosis and hence has the best prognosis.

The concept of intra-epithelial carcinoma can by no means be claimed by our generation as its own. The medical world was first introduced to this subject in 1908 by Schottlaender and Kermauner, who observed that a surface layer of malignant cells was often found at the periphery of deeply invasive carcinoma and concluded that cervical cancer progressed in this manner. Schiller, after years of exhaustive and meticulous histologic investigation, presented us, in 1928, with the evidence that this surface layer of malignant cells, or intra-epithelial carcinoma, may exist before invasive cancer, and he deduced that intra-epithelial carcinoma was the precursor of invasive carcinoma.

Our own generation can take credit, however, for giving clinical expression to this histologic concept of intra-epithelial carcinoma, introduced by Schottlaender and Kermauner and crystallized by Schiller. Notable contributions during the last two decades have been made by Pemberton and Smith, Stevenson and Scipiades, TeLinde, Pund, and Younge. The monumental discoveries of Papanicolaou and Traut in their cytological study of vaginal smears has stimulated our search for the early lesion and must be regarded as a most useful adjunct in our detection of incipient cervical cancer.

Since the diagnosis of intra-epithelial carcinoma is histologic and not clinical, the lesion must be described in terms of its microscopic appearance. Thus, it may be defined as a lesion of the surface epithelium of the cervix in which the cells possess all the morphological and staining qualities of malignant cells, but as yet lack the power of invasion. These cells have maintained their normal position and have not broken through the basement membrane to penetrate the underlying stroma.

One must be mindful of the simple histology of the normal surface epithelium of the portio vaginalis of the cervix before the picture of intra-epithelial carcinoma

[1] From the Department of Gynecology, Johns Hopkins Hospital, Baltimore, Md.

can be appreciated. The normal epithelium is stratified or divided into three more or less well defined layers; the basal layer consists of only one or two relatively small cells with large, dark-staining nuclei in which mitotic figures are occasionally seen but by no means frequently; the transitional layer is made up of many relatively large, clear-staining polygonal cells; the spinal layer is composed of flat, elongated cells with small, insignificant nuclei. The entire epithelium is well separated from the underlying stroma by the so-called basement membrane.

Fig. 1. Intra-epithelial carcinoma.

In contrast to this picture, is that of intra-epithelial carcinoma (Fig. 1) where the cells making up the surface epithelium show no stratification into distinct orderly zones and where all the cells are more or less of the same type and possess the criteria of malignancy in their cellular outline, in their staining characteristics, and in the irregularity and anaplasia of their nuclei. Characteristically, however, there remains a sharp demarcation between the surface epithelium and the underlying stroma and there is no evidence of invasion. The startling contrast between the normal and the abnormal epithelium not infrequently presents itself as in Figure 2, where there is an extremely sharp demarcation between the normal epithelium on the left and intra-epithelial carcinoma on the right.

There are still some skeptics, who, while admitting that these abnormal cells possess in themselves the characteristics of malignancy, insist upon ectopia or invasion of the cells before permitting a diagnosis of carcinoma; who refuse to admit that carcinoma has an infancy and an adolescence and will recognize only the adult form. They ask: Does this lesion of so-called intra-epithelial carcinoma have the potentiality of invading and destroying normal tissue; will it, if left untreated, develop into clinically recognizable cancer and eventually cause the death of the host?

This question must and can be answered from the clinical as well as the histologic point of view. From the clinical side, pres-

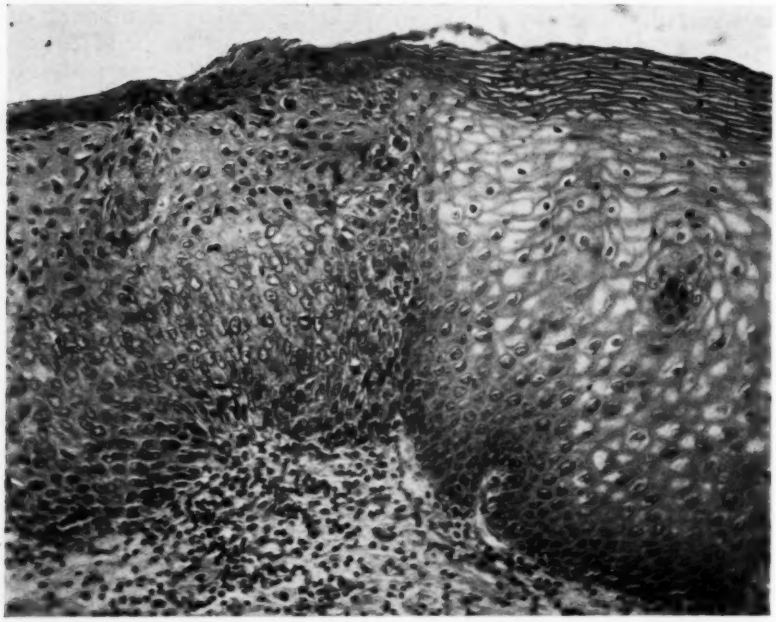

Fig. 2. Sharp demarcation between normal epithelium on the left and intra-epithelial carcinoma on the right.

entation of a recent case at the Johns Hopkins Hospital seems pertinent. This patient, now thirty-eight, was first seen in the Out-Patient Department in August 1943, complaining of lower abdominal pain but no abnormal vaginal bleeding. Examination revealed evidence of a chronic pelvic inflammatory disease which was thought adequate to explain the symptoms. On routine inspection of the cervix, a small ulcerated area which bled when irritated was noted and biopsied. Microscopically, this biopsy was interpreted at the time as showing only chronic cervicitis, and no specific therapy was directed to the cervix.

Three years later, because of the persistence of abdominal pain, a supravaginal hysterectomy and bilateral salpingo-oöphorectomy was carried out at another hospital, and the patient remained asymptomatic until August 1949, when she began having persistent vaginal bleeding, for which complaint she was again seen at the Hopkins Hospital in October 1949, the first time since her original visit in 1943.

A restudy of the biopsy specimen obtained in 1943 and diagnosed then as chronic cervicitis reveals that the surface epithelium possesses all the characteristics of malignancy save invasion (Fig. 3A), while six years later, with no treatment directed to the cervix, the patient has a fairly far advanced, clinically recognizable cervical cancer which microscopically is indisputable invasive carcinoma. (Fig. 3B).

In a word, this is an example of untreated intra-epithelial carcinoma which six years later developed into clinically recognizable cancer of the cervix. This case of course is not unique. A perusal of the literature reveals seventeen additional cases in which clinical carcinoma developed six months to twelve years after the diagnosis of intra-epithelial carcinoma was made by biopsy but was untreated.

Regarding the relationship of intra-epithelial carcinoma to invasive carcinoma from the histologic aspect, a section such as shown in Figure 4, while not conclusive, is extremely suggestive that the former is the precursor of the latter. In this very low-

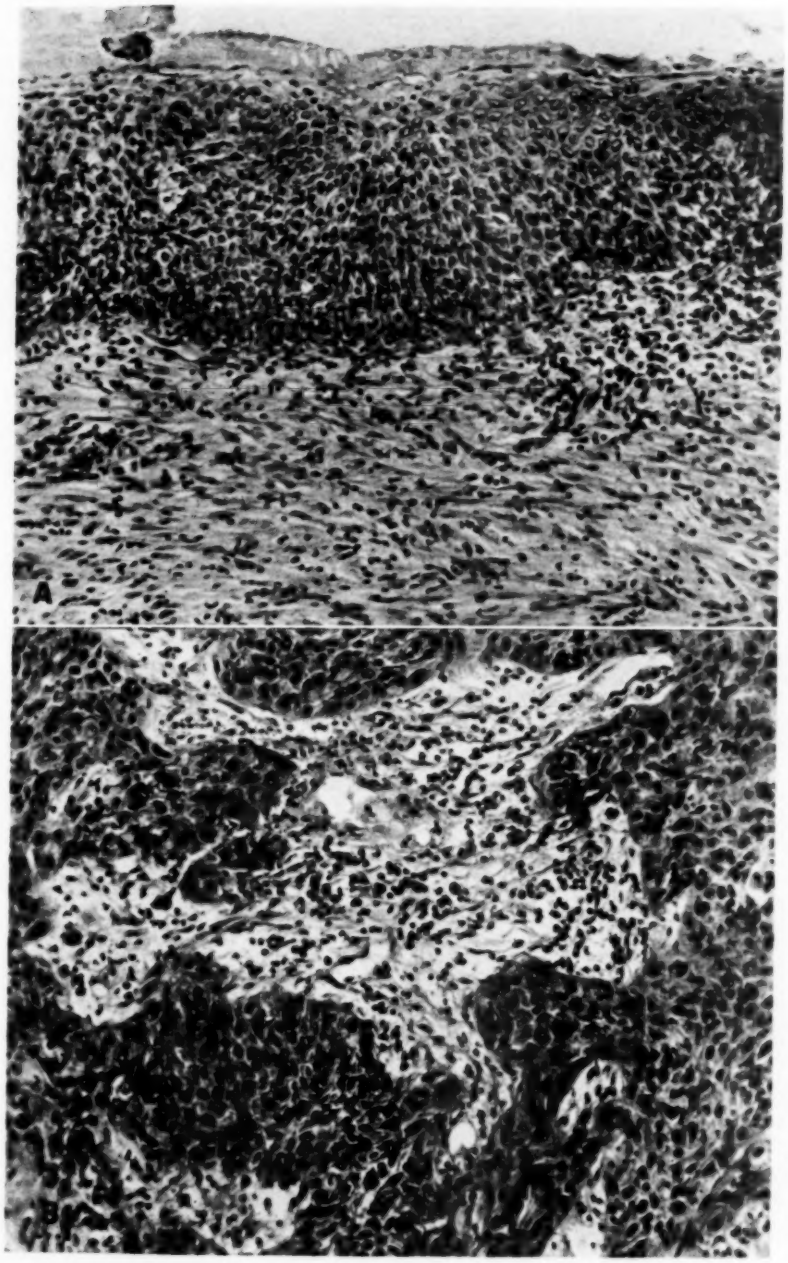

Fig. 3. Untreated intra-epithelial carcinoma (A) interpreted as chronic cervicitis, developing six years later into clinically recognizable invasive cancer (B).

power magnification of an entire section from a removed cervix, there is to be seen normal epithelium, atypical epithelium, intra-epithelial carcinoma, as well as invasive carcinoma. Such a picture is seen so frequently, either with or without evi-

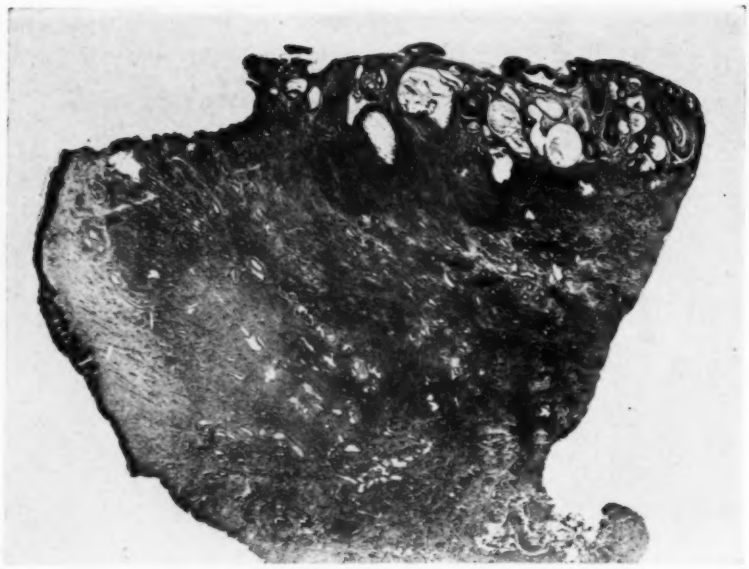

Fig. 4. Section of a removed cervix showing normal and atypical epithelium, intra-epithelial and invasive carcinoma, indicating that surface carcinoma may be a forerunner of invasive growth.

dence of stromal invasion, that one is forced to feel that surface carcinoma may be the forerunner of invasive carcinoma.

Characteristic of intra-epithelial carcinoma is the fact that it occurs in a younger age group, that it displays no pathognomonic signs or symptoms, that it progresses slowly over a period of years, that it can be detected only by biopsy or the cytological smear, and that, when detected and treated, it can be completely eradicated in a very high percentage of cases.

Statistics tell us that the average age of patients with clinical carcinoma is slightly in excess of forty-six years, while in a series of 108 cases of intra-epithelial carcinoma at the Hopkins Hospital, we have found the average age to be 36.7 years. Pund, in a similar group of cases, found the average age to be 36.8.

In this early stage, carcinoma does not as a rule favor us with symptoms. Only 32 per cent of our cases presented complaints of cervical origin; of these by far the most important was intermenstrual spotting, particularly post-coital in occurrence. True, the cervix harboring this lesion rarely appears absolutely normal, but it is also true that its appearance rarely arouses the suspicion of cancer and that it is usually described as showing a laceration, eversion, erosion, small ulceration, or merely evidence of chronic infection.

Since in the pre-invasive stage, cervical carcinoma as a rule, presents no symptoms, and since the appearance of the cervix rarely betrays its presence, one can hope to detect it only by generous use of the cervical smear or the cervical biopsy. The validity of the cervical smear in detecting cancer cells can no longer be questioned. Our experience with this cytologic examination has been unencouraging, however, and we cannot be too enthusiastic about its practical application. We are prone to feel that the interpretation of smears should be undertaken only by well seasoned cytologists. On the other hand, relying on cervical biopsies alone, we have in the course of nine years diagnosed surface carcinoma in 108 cases. All these cases have been from our own private and ward services at the Hopkins Hospital, and in 92 of them the diagnosis has been substantiated by subsequent hysterectomy or

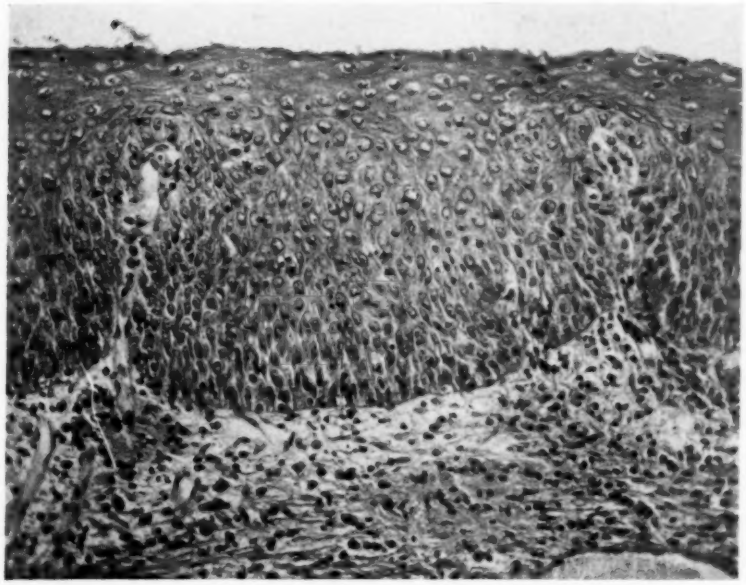

Fig. 5. "Basal-cell hyperactivity" or "simple atypical epithelium," simulating intra-epithelial carcinoma.

cervical conization. The removed cervix in the remaining 16 cases did not sustain the preoperative diagnosis.

The secret of our ability to detect the early lesion lies not in our method of taking biopsies nor in any special acumen in the use of the microscope. It lies in the fact that our entire staff is extremely conscious that any cervix that appears in any way abnormal may harbor a latent carcinoma and, with this fact in mind, we make generous use of the biopsy clamp. Our records support the contention, as recently emphasized by Locke, that the number of non-invasive carcinomas detected will be in proportion to the number of biopsies taken. We find that in 1942, when 652 cervical biopsies were taken in our Gynecological Service, intra-epithelial carcinoma was found in only 4 cases, while in 1947, when 3,008 cervical biopsies were obtained, a non-invasive lesion was detected in 12 instances.

In our enthusiastic search for these early lesions we are likely to fall into the grave error of considering minor grades of hyperactive or atypical epithelium as intra-epithelial carcinoma. To this condition we have given the term "basal-cell hyperactivity," while Hinselman, and now Wespi, refer to it as "simple atypical epithelium." This abnormality of the epithelium (Fig. 5) is characterized by overactivity of the basal cells; the basal zone, instead of consisting of one or two cells, is now several cells in thickness, and the cells themselves possess anaplastic characteristics simulating malignant growth. The surface architecture, however, has been fairly well preserved, there remains a definite stratification of the surface epithelium, and the superficial cells are still normal in appearance.

We have seen this microscopic picture many, many times in biopsy and operative specimens, and it is commented upon at length, particularly in the German literature. The real significance of it is still not completely understood, although we do feel that it might be influenced by inflammation as well as by hormonal stimulation, as demonstrated by the unpublished work of Eperson and Hellman in their histologic study of the cervix in pregnancy. Our

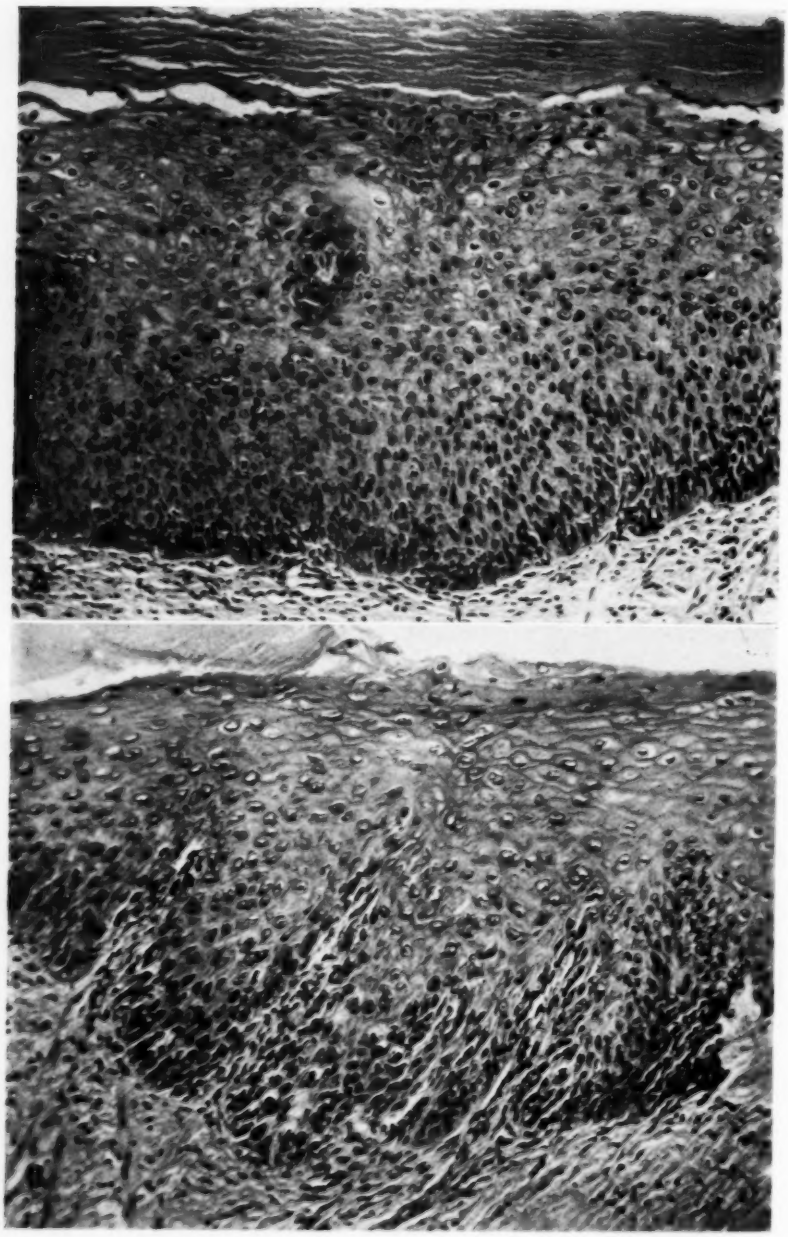

Fig. 6A and B. Successive cervical biopsies in a case in which invasive carcinoma eventually developed. A. February 1947: "basal-cell hyperactivity." B. Three months later: same condition, slightly more marked. See also Fig. 6C and D.

studies have, however, definitely indicated to us that this reaction may be a reversible one, and that repeat biopsies taken several months and several years later may show only normal cervical tissue. Yet we continue to look upon this condition with great

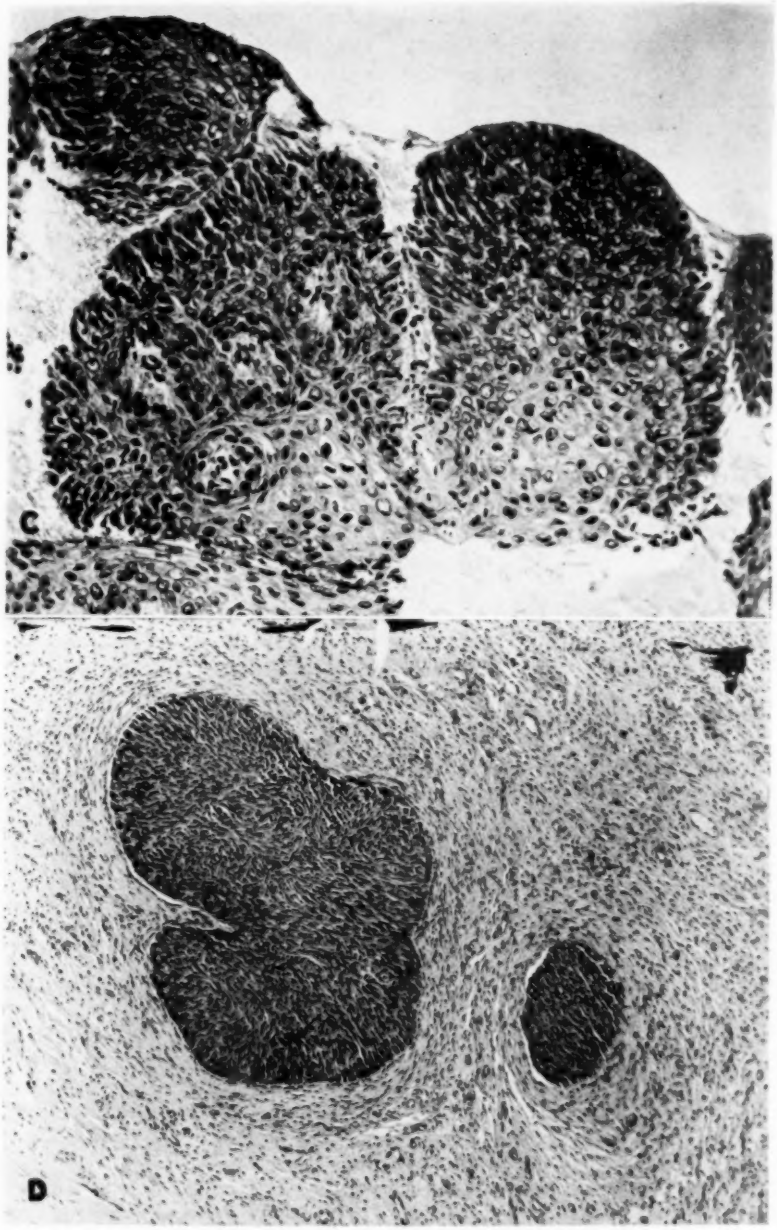

Fig. 6C and D. C. September 1947, seven months after original biopsy (Fig. 6A): criteria of intra-epithelial carcinoma. D. Fourteen months after original biopsy: island of carcinomatous tissue deep in the cervical stroma.

suspicion, since in some of our cases, as proved by repeat biopsies, carcinoma has eventually developed, as might be illustrated by Figure 6 which shows successive cervical biopsies on a thirty-five-year old negress. The original biopsy (Fig. 6A),

in February 1947, exhibited only "basal-cell hyperactivity"; the second biopsy (Fig. 6B), taken three months later, again showed the same condition but a bit more marked; the third biopsy (Fig. 6C) in September 1947 revealed the criteria of intra-epithelial carcinoma, while the fourth specimen (Fig. 6D), obtained on cervical conization fourteen months after the original biopsy, showed an island of carcinomatous tissue deep in the cervical stroma.

So, while we sound a note of restraint in regarding simple atypical epithelium as surface carcinoma, we also exhort the pathologist and the clinician to be suspicious of the condition and follow the patient closely with repeat biopsies.

In conclusion, it might be stated: (1) that clinical and histological evidence support the contention that intra-epithelial carcinoma is the precursor of invasive cancer of the cervix, and (2) that this lesion, when present, will be diagnosed if the clinician is ever aware that any abnormal appearing cervix may harbor a latent carcinoma and if the pathologist is ever suspicious of hyperactive epithelium in cervical biopsies.

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The Dispersion of Cancer of the Cervix[1]

ERLE HENRIKSEN, M.D.
Los Angeles, Calif.

THE MORE IMPORTANT of the several routes of dispersal in cancer of the cervix is not easy to establish, as occasional evidence of both direct and lymphatic spread is found in the grossly early clinical case. That the type and degree of dispersion are important in the selection of therapy is apparent, but the presence or absence of early extension is difficult, and frequently impossible, to predicate.

Both clinical and pathological observations recognize the convenience of separating the major lymph nodes into a primary group, which includes the paracervical, ureteral, obturator, hypogastric, and external iliac nodes, and a secondary group which includes the common iliac, aortic, sacral, and inguinal nodes (Fig. 1).

The three main channels draining the cervix permit a fairly constant pattern of metastatic spread, and in most instances, one or more nodes of the primary group are involved before the level of the secondary group is reached. However, rich intercommunicating channels and anomalous nodes account for the unpredictable sites and routes of some of the metastases.

The incidence of node involvement in a series of 202 treated and 154 non-treated cases of cervical carcinoma, studied at autopsy, is set forth in Table I. Whereas, 58.5 per cent of the primary and 70 per cent of the secondary nodes were involved in the treated series, only 44.7 per cent of the primary and 39 per cent of the secondary nodes were affected in the non-treated series. Unfortunately, the correct interpretation of these differences is difficult, and it is possible only to theorize that the

TABLE I: INCIDENCE OF NODE GROUP INVOLVEMENT IN 356 CASES OF CERVICAL CARCINOMA

	Primary Node Involvement	Secondary Node Involvement	Distant Metastases
Stage I	%	%	%
Treated	85	85	41
Non-treated	2	..	..
Stage II			
Treated	77	65	37
Non-treated	20	4	2
Stage III			
Treated	50	58	26
Non-treated	31	27	15
Stage IV			
Treated	52	53	57
Non-treated	67	64	62
Total			
Treated	58.5	70	37.8
Non-treated	44.7	39	32.5

[1] From the Department of Gynecology, University of Southern California.

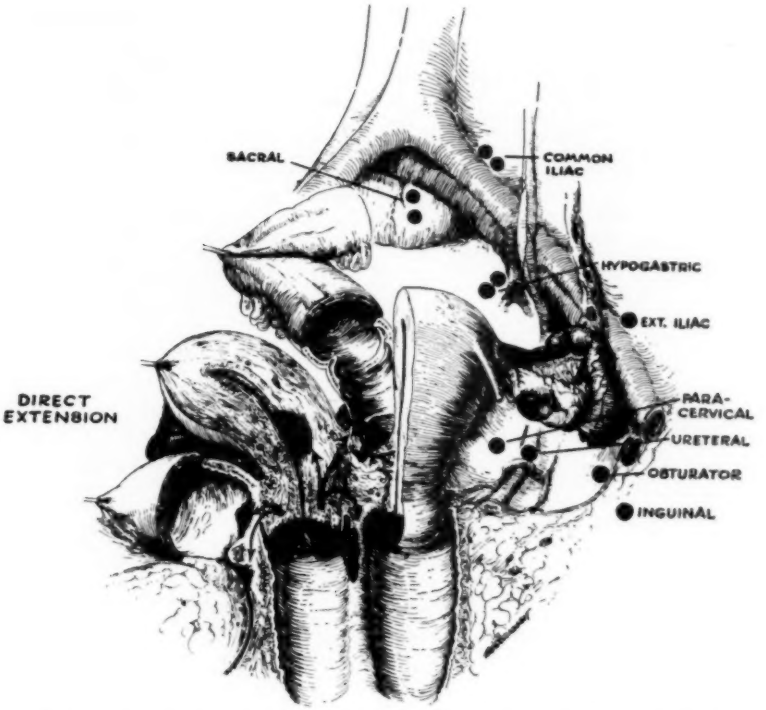


Fig. 1. Spread of cervical carcinoma by the lymphatics and direct extension.

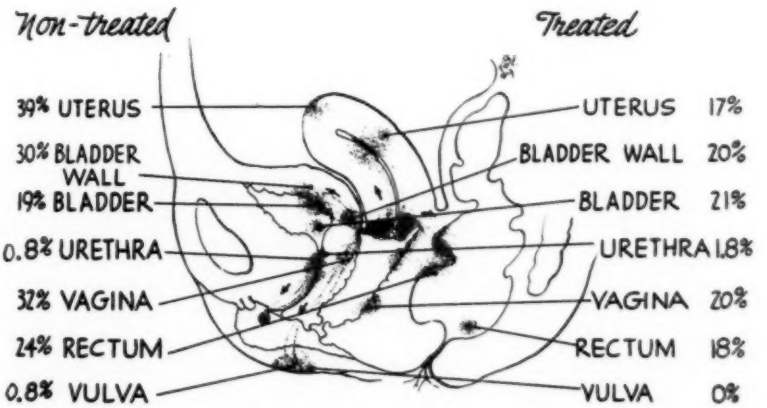
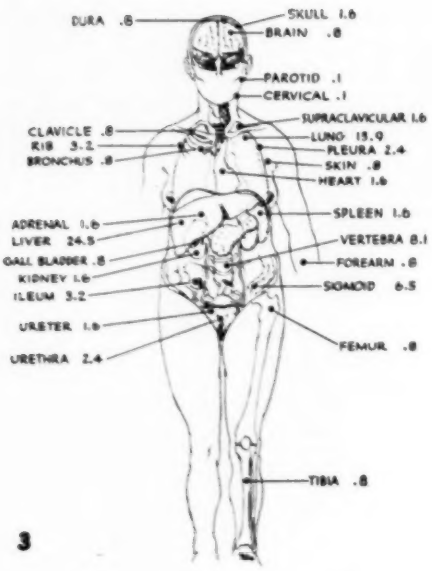
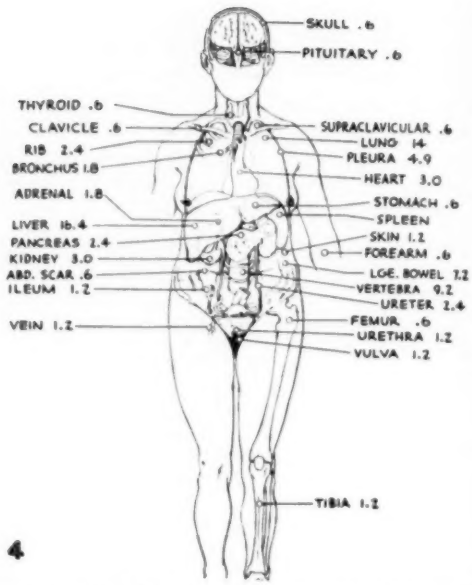


Fig. 2. Incidence of organ involvement in 154 non-treated and 202 treated cases of cervical carcinoma.

local extension was temporarily controlled in the treated cases, thus permitting time for the increase in nodal dissemination. That this theory is not completely valid is attested by the presence of distant metastases in 37.8 per cent of the treated and 32.5 per cent of the non-treated cases, an inappreciable difference in this relatively small series of cases.

The true clinical stage of the disease is





Figs. 3 and 4. Incidence of distant metastases in 154 non-treated cases of cervical carcinoma and in 202 treated cases of cervical carcinoma. (From Henriksen, Erle: The Lymphatic Spread of Carcinoma of the Cervix and of the Body of the Uterus. Am. J. Obst. & Gynec. **48:** 924–939, November 1949.)

difficult to establish except at surgery or autopsy. Palpably normal parametria are not irrefutable evidence of the absence of malignant extension. Unfortunately, distant metastases do occur in the early stages of the disease. It is also possible, though relatively uncommon, to have distant metastases in the proved absence of parametrial involvement. However, no specific test or examination permits the demonstration of these distant metastases until their presence is subjectively manifested.

The spread of cervical carcinoma by direct extension (Fig. 1) follows definite anatomical planes. The proximity of the bladder results in the frequent involvement of that organ. The cul-de-sac of Douglas serves as a barrier, delaying direct extension to the rectum until the disease has, in most instances, included the posterior vaginal wall. Lateral extension meets with little obstruction; thus parametrial involvement is common. From our material as presented in Figure 2, it is noted that the difference of the incidence of involvement by direct extension in the treated and non-treated series allows of no significant interpretation. The similarity of the pattern and frequency of direct extension is further attested by the incidence of vaginal fistulas in the two groups (Table II). Except for the variation in the type of fistula, the incidence is practically identical. This adds support to the theory that the majority of vaginal fistulas result from malignant extension rather than from radionecrosis.

TABLE II: INCIDENCE OF VAGINAL FISTULAS IN TREATED AND NON-TREATED CASES OF CARCINOMA OF THE CERVIX UTERI

	Vesico-vaginal	Recto-vaginal	Both
Treated cases (202)			
Stage I	1	0	0
Stage II	3	1	1
Stage III	5	8	5
Stage IV	4	4	6
Percentage with fistula: 18.8			
Non-treated cases (154)			
Stage I	0	0	0
Stage II	4	0	1
Stage III	7	0	5
Stage IV	6	2	6
Percentage with fistula: 20.1			

Distant metastases, the unpredictable stumbling blocks to successful treatment, be it surgical or radiation, occur more frequently than is usually accepted. Neither the clinical status nor the histologic index unequivocally predicates their presence or absence. Examining the material in Figures 3 and 4, it is noted that the liver was the most frequent site of metastases, with the bones, lungs, and bowel involved in that order. Radiation apparently has little effect on the selection of the metastatic site.

The possible wide dissemination of the disease is further emphasized by the presence of metastases in the skin of the chest, axillary nodes, cervical nodes, pituitary gland, parotid gland, and the left supraclavicular node, a site commonly associated with gastric cancer.

The extension of the disease along the main lymphatic channels, except for the occasional massive nodal masses at the pelvic brim, is not always of serious immediate prognostic importance. The majority of patients die from effects referable to the organs and tissue involved by direct extension, *i.e.*, uremia. However, the two means of dispersal are intimately related, and it is unusual to find extensive involvement of the node groups without equally extensive involvement by contiguous spread.

Unfortunately, our observations at autopsy offer no opportunity to study the action of radiation. For the most part, in the treated case the course of radiation therapy had been completed an average of 2.4 years before death. It is permissible, however, from both clinical and pathologic data, to suggest, first, that the demonstrable effect of radiation is not consistent in the same patient or in the same tissue field; and second, that the presence of a normal appearing lymph node in a group of nodes displaying evidence of radiation damage suggests the possibility of lymphoid tissue selectivity to the effects of radiation.

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The Classification of Cervical Cancer[1]

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AS LONG AS carcinoma of the cervix has been recognized and treated as such, a decided difference in the curability of this malignant process has been observed. Many factors of the disease have been explored in an endeavor to account for this disparity. Born of these investigations are our various designs for the classification of cervical cancers; we find that they have been indexed according to their amenability to surgery, according to their gross morphology, according to their histological characteristics, and according to their anatomical extension. The objectives of these groupings have been to facilitate our choice of therapy, to govern us in our prognosis, and to give us a means of comparing the efficacy of various types of treatment under essentially the same conditions.

While surgery stood alone as our only therapeutic approach to cervical cancer, the division of cases into operable, borderline, and inoperable was acceptable. Even then, however, such a division was not ideal, as the decision as to operability was inevitably influenced by the radicalness or conservatism of the surgeon's own point of view, as well as the patient's general condition, and depended too little upon the objective factors of the lesion itself. Now, since radiation more often than surgery is concerned in the therapeusis of cervical cancer, it becomes inconsistent to designate a lesion as operable or inoperable, and even more inconsistent to report

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results in terms of surgical attack when radiation has been the chief, if not the only, treatment. It seems evident that any classification based upon the amenability to a definite type of therapy is undesirable.

To Ruge and Veit we owe the now time-honored division of cervical carcinomata into the two gross morphological types—everting and inverting. The everting or cauliflower form of growth, arising from the portio, although alarming in appearance, was thought to be less treacherous, as it expended the greater part of its energy in growing into the cavity of the vagina and showed little tendency to invade the deeper tissues. The inverting or scirrhous type, originating in the endocervix, produced enlargement of the cervix as a whole, was more likely to ulcerate and infiltrate the parametrial tissues, and hence was considered the more malignant form. This classification, to be sure, possesses the advantage of simplicity and, we must admit, is based upon the now well known clinical fact, as stated by Norris, "that neoplasms that are soft, friable, highly vascular, and of the so-called cauliflower type undergo marked primary regression and disappear rapidly under suitable irradiation." Too, we are all aware that this papillary type of tumor, due to its greater tendency to bleed, usually gives symptoms and is diagnosed at an earlier stage and for this reason enjoys a much better prognosis. Yet this classification fails to consider the extent of invasion adjacent to the tumor and it becomes impossible, in the relatively advanced stage, to ascertain in what part of the cervix the lesion originated, as both eversion and inversion occur at the same time, in the same cancer. Such a morphological division, therefore, although at times helpful in our estimation of prognosis, does not meet the requirements of a basic division of cervical neoplasms.

For many years we have made it a practice to allocate squamous-cell carcinomata to specific classes or grades according to their histologic appearance, with the idea that the neoplasms composed of the least differentiated cells are the most rapidly growing, the most malignant, and the most susceptible to radiation. Schottlaender and Kermauner recognized three types of epidermoid carcinomata under the microscope, the unripe, the midripe, and the ripe. Broders separated these same tumors into Grades I, II, III, and IV, in the order of decreasing differentiation and increasing malignancy. Martzloff classified them as spinal-cell, transitional-cell, and spindle-cell, according to the predominant cell, and related predominant cell type to curability.

Broders' codification hinges upon the degree of anaplasia of the cells composing the tumor, his histologic criteria indicative of anaplasia being atypical qualities of the cells, variation in size, shape, and staining qualities of the nuclei, loss of polarity, number and atypical quality of mitoses, and infiltrative tendencies. Those carcinomata whose cells exhibit the least anaplasia and most closely approach normal cells are assigned to Grade I and are given the best prognosis, while those tumors composed of cells with the greatest amount of anaplasia are placed in Grade IV and considered the most malignant.

Martzloff divided epidermoid carcinomata of the cervix with respect to the predominant cell, identifying three fairly distinct classes, which he designated as the spinal-cell, the transitional-cell, and the fat spindle-cell types. He compared the predominating cells of the spinal-cell type with those polyhedral cells seen in the more superficial layers of ordinary cervical epithelium; these were regarded as the most highly differentiated and the least malignant. The component cells of the fat spindle-cell type Martzloff compared with the basal cells of the vaginal lining of the cervix; these were regarded as the least differentiated and the most malignant. The constituent cells of the transitional-cell type he compared with those seen in the middle layer of the vaginal lining of the cervix. Cancers composed of these cells he considered as standing midway between the other two in all respects.

Martzloff's deduction as to the graded malignancy of these various cell types of cervical cancer stemmed from his exhaustive study of 203 cases of cervical carcinoma submitted to surgery at the Johns Hopkins Hospital, prior to 1920. Of those patients that he was able to trace, 26 per cent were found to have been free of the disease five years after operation. Of these five-year cures, Martzloff showed that in 47 per cent the removed tumor was composed predominantly of the spinal type of cancer cell, while in 24 per cent it was made up of the transitional-cell type, and in only 10 per cent of the fat spindle-cell type. From this investigation he concluded that "the predominant type of cell in epidermoid carcinoma of the cervix is important in that it indicates the relative malignancy of a given tumor, the spinal-cell type being the less malignant and the spindle-cell being the most malignant."

Martzloff himself calls attention to the marked histologic similarity between his spinal, transitional, and spindle-cell types and Broders' Grades II, III, and IV, respectively. He was also able to point out a decided agreement between his figures concerning surgical cures in their relation to predominant cell type and those obtained at the Mayo Clinic, where the Broders histologic classification was used.

Martzloff's findings, and there have been no other published reports of similar investigations, seem to indicate that, when treated surgically, the spinal-cell type enjoys the best prognosis and the spindle-cell type the worst. On the other hand, numerous workers have attempted to correlate cell type and response to irradiation, and all these investigations have been uniformly disappointing. Norris, Morton, Pemberton, Maliphant, and others have been unable to demonstrate any relationship between predominant cell type or degree of anaplasia in any tumor and its eventual curability. Morton states that "even if reliable histological divisions were possible it would not be logical to correlate the factor of cell type with degree of malignancy nor with radiosensitivity, nor with curability expressed in terms of five-year cures because of the multitudes of other factors involved in the determination of these conditions. Other factors, such as the size, form, and gross extent of the tumor, are quite definite and far more pertinent than cell type." These contentions are borne out by the findings of other investigators, and we must conclude that the histologic appearance of squamous-cell carcinomata of the cervix does not meet the requirements of primary classification of cervical cancers, though it may be of some value in our choice of therapy.

TABLE I: CLASSIFICATION OF CERVICAL CARCINOMA ACCORDING TO ANATOMICAL SPREAD

	Schmitz	League of Nations
Stage I	Clearly localized in cervix. Cervix freely movable	Strictly confined to cervix
Stage II	Doubtfully localized in cervix. Mobility of cervix impeded	Infiltrates parametria but does not invade pelvic wall
Stage III	Invades parametria or regional lymph nodes. Entire mass is movable	Infiltrates parametria and invades the pelvic wall
Stage IV	Frozen pelvis with fixation of tumor. Extension to bladder or rectum. Distant metastases	Extension to bladder or rectum. Spread outside of true pelvis

Those who have seriously concerned themselves with the study and treatment of cervical carcinoma and understood its clinical course and history are now agreed that the clinical extent of the lesion when first seen and treated must form the basis of our primary classification. At the present time there are in popular use in this country two such systems, based upon the anatomical spread of the disease. They are the Schmitz system and the League of Nations system. The two agree in essentials but differ in particulars.

The Schmitz classification of cervical cancer, evolved from the numerous studies and publications of Henry Schmitz from 1920 to 1938, is given in Table I in its present simplified form. The League of Nations classification was drawn up in 1928 by Heyman of Stockholm, Lacassagne of Paris, and Voltz of Munich, at the request of the radiological subcommission of the

League of Nations. This classification is also seen in Table I.

As stated by Heyman, a system or plan for the classifying of cervical carcinomata should meet these requisites:

(1) That the definitions of the different stage groups should be as simple and precise as possible.
(2) That the rules for allocating cases to their appropriate stages should be easily interpreted.
(3) That one stage should be differentiated from the other by characteristics easily recognized on clinical examination even by a less trained examiner.
(4) That the system should be sufficiently complete to include every possible type of cervical cancer.
(5) That each stage group should contain a number of cases sufficient for statistical evaluation.
(6) That the suggested rules should meet with international agreement.

In instituting a comparison of these two plans of indexing, it is observed that League of Nations Stage I corresponds approximately to Schmitz Stages I and II, while the Schmitz Stage III closely conforms with League of Nations Stages II and III. Stage IV differs only slightly in the two systems. Hence, any contention over the merits of these two systems must be concerned with two questions: (1) Does the Stage III classification of Schmitz need further subdivision? (2) Should Stage I of the League of Nations classification be broken down into two groups?

There seems to be little difference of opinion among clinicians and therapists as to what constitutes the early favorable case, and we are agreed that, regardless of what kind of treatment is instituted, provided it is adequate, our chance of obtaining a five-year cure in such a case is very good. Likewise we all agree upon the late hopeless case and admit that, regardless of the type of therapy, the prognosis is extremely poor. It is in the intermediate group that difficulty of classification is experienced. Too, it is in this group of cases where, with improved methods of irradiation and surgery, we are endeavoring to achieve an improved five-year salvage rate. This collection of cases which fall between the early stage and the late stage in which the carcinoma has spread beyond the confines of the cervix but has not reached the "frozen pelvis" state is a large and formidable group, comprising 60 per cent of the cases we see. The Schmitz classification allocates all these cases to Stage III, while the League of Nations scheme divides them into two stages, using particularly the extent to which the broad ligaments are involved as the basis of the division.

TABLE II: LEAGUE OF NATIONS STAGING AND CURE RATE OF 30,299 CASES—COMBINED STATISTICS FROM 24 RADIOTHERAPEUTIC CENTERS

	Patients (Per Cent)	Five-Year Cures (Per Cent)
Stage I	12.7	59.6
Stage II	33.1	41.2
Stage III	38.1	22.9
Stage IV	16.1	6.2

Without considering how well or how poorly this breakdown is achieved, it must be granted that the classification system which groups 60 per cent of the cases into one and the same stage is not wholly satisfactory, while the system that attempts to subdivide this preponderant number of cases more closely approaches the ideal. In order to appreciate how well this objective is attained, we can refer to the recently published report on the results of radiotherapy in cancer of the cervix by Heyman, Donaldson, and Scheffey, in which the League of Nations classification was adhered to. Here we find (Table II) the combined statistics from 24 radiotherapeutic centers in eight different countries as to the staging and five-year results in a total of 30,299 patients treated from 1936 to 1941.

As reflected in the percentage of cases allocated to Stage II and Stage III, these figures seem to attest that the League of Nations classification divides the intermediate group of carcinomata quite well.

Too, the decided difference in the five-year cure rates between League of Nations Stage II and Stage III, as seen in this compilation of figures, indicates that there is a differential prognosis among the large group of cases that fall between the early and the late stage and emphasizes the necessity for subdivision of this group.

A comparable compilation of figures from these clinics, employing the Schmitz classification, is not available. Such figures, however, if obtained, would of necessity show an overload of cases in one group.

Due to recent progress in our understanding of the histologic picture of incipient cervical cancer, our conception of an early carcinoma is changing and we are beginning to allocate to this category the lesion which can be diagnosed only microscopically. As a result of our more generous utilization of the cervical biopsy and the Papanicolaou smear, more and more of these microscopic cancers are being detected. It is also true that such lesions, when treated adequately, give a decidedly better prognosis than the gross carcinoma which is still confined to the cervix. Hence, it seems that the League of Nations classification is deficient in not providing a distinct category for these non-invasive or superficially invasive cancers that uniformly possess such an excellent prognosis. But, does the Schmitz classification meet this deficiency in its Stage I, which is defined as a nodular lesion of the cervix not more than 1.5 cm. in diameter? Hardly so, as such a cancer can be grossly seen and felt and microscopically shows deep stromal invasion and hence does not enjoy the same excellent outlook as does the clinically non-suspicious and histologically non-invasive or superficially invasive carcinoma.

Our subdivision of carcinomata limited to the cervix should provide a group to include only those carcinomata that are neither visible nor palpable on vaginal examination, which can be diagnosed only by histologic criteria. Such a subdivision will not only keep our interchange of statistics on a more comparable basis but it will also be an added incentive to early diagnosis and will encourage the general practitioner, as well as the rest of us, always to be suspicious of cervical carcinoma even in the absence of a gross lesion.

In summary, it seems that only the anatomical spread of cervical cancer can be universally used as a basis of classification; that the League of Nations classification approaches more closely the ideal than does the Schmitz classification, but that a separate group must be created to include only the early microscopic cervical cancer.

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The Surgical Treatment of Cancer of the Cervix[1]

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DESPITE THE technical advances in radiotherapeusis, the fact is established that approximately 20 per cent of clinical Stage I and 30 per cent of clinical Stage II cases of cervical carcinoma are not cured by radiation therapy (1). The basic causes of failure in the early stages of this disease could be, first, a radioresistant type of tumor; secondly, a vaguely understood biologic difference of the tissues of the host; thirdly, an error in the clinical estimate of the actual extension of the disease.

Within the past decade, accruing observations question the position of radiation as the exclusive therapeutic approach. The bugbear of high operative mortality associated with the formidable procedures in the past has disappeared. Unfortunately, it is impossible to compare statistics,

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for the large series of the past did not have the benefits of the recent advances in surgery, and the present series are too recent to permit intelligent appraisal. Another difficulty is the invalidity of the comparison of cases in the several clinical stages. Though the establishment of such classifications is invaluable, the error of clinical judgment is approximately 25 per cent when the true estimate is established at surgery or autopsy.

these cases, despite occasional reports to the contrary. Multiple-block examination of the cervices preoperatively diagnosed as carcinoma *in situ* occasionally discloses invasive lesions distant to the site of the original biopsy. In such cases, instead of a Stage 0, we are dealing with a Stage I or possibly Stage II neoplasm.

For the Stage 0 cases, we subscribe to the surgical procedure advocated by Te-Linde (Fig. 1, A). This is a radical total

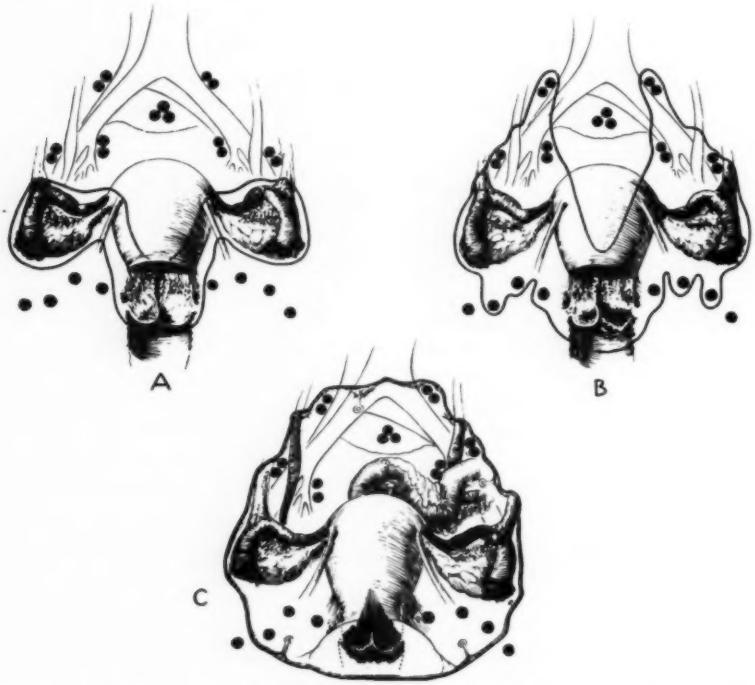

Fig. 1. Diagrammatic outlines of suggested procedures for the surgical treatment of cervical carcinoma.

The increased interest in the preclinical stage of cervical carcinoma, aided by the development of the cytologic examination of the exfoliated cells, has resulted in the advocacy of surgery as the method of choice in this type of case. The success of surgery in the so-called carcinoma *in situ*, or clinical Stage 0 case, is entirely dependent on the thoroughness of the preoperative study, *i.e.*, the correct estimate of the clinical stage of the disease.

There is no extension of the lesion in

hysterectomy. Since many of these cases are in a younger age group than those with the more extensive type of lesion, the ovaries are not routinely removed. From the illustration, it will be seen that very little of the parametrium and none of the lymph nodes are removed, but if the clinical estimate of the disease is correct, the cure is certain. Unfortunately, too many benign lesions of the cervix are uncritically interpreted as carcinoma *in situ* and too many young women are receiving either

surgery or radiation without proved indications.

For those carefully selected cases in the Stage I and early Stage II groups, Meigs (Fig. 1, B) performs a radical total hysterectomy, with removal of the regional lymph nodes. Despite his remarkably low mortality rate, this is not a simple operation. If the disease is definitely in the Stage 0 group, the operation is too formidable, and if there is extension to the parametrium and/or lymph nodes, the cases are too recent to permit appraisal. We do find Stage II cases with dispersion limited to one or more of the regional nodes, and these cases are possibly cured. The operation, however, will not remove all of the possibly involved tissue, and a more radical dissection is necessary. For the present, we suggest this type of treatment for those cases proved to be radioresistant. Unfortunately, this procedure advocated by Meigs, in whose hands the results seem to be excellent, is anatomically and pathologically incomplete when malignant dispersion is present. It is this operation, widely employed by surgeons inexperienced in both the technic and the indications, that is being much abused.

Recently, Brunschwig (Fig. 1, C) has described the now widely publicized and much maligned exenteration operation. Unfortunately, the procedure is a formidable one, demanding experience and materiel far beyond the average surgical service. We do not offer it as a curative measure, but as a means to lessen the effects of the extension of the disease within the pelvis, which, despite distant metastases, is the most frequent cause of death.

This tremendous and physiologically mutilating operation overwhelms me with respect for those few men able and willing to perform it, and with complete disrespect for the too many men trying to perform it. Time wil determine whether the strain of this operation on both the doctor and the patient is justifiable.

Thus, at this time, while radiotherapy is still the method of choice, careful individualization of the case will in some instances permit better results by surgery than by radiation. It is not intended that surgery replace radiotherapy, but improved methods of diagnosis and the advances in surgical technic do offer excellent results in selected cases. The two methods of treatment should not be considered as competitors, but as supplementary adjuvants in the co-ordinated effort to improve the salvage rate.

One outstanding fact is established: until a cure of cancer is found, or some new form of treatment is evolved, radiotherapy and surgery, despite their admitted inadequacy, represent our only therapeutic devices. As we review our material, it is all too apparent that a high salvage rate in the treatment of cervical carcinoma does not reflect solely the technical ability of the radiologist or the surgeon. Good results mirror the experience and judgment of the physician and his ability to estimate the clinical status of the disease and to select the best type of treatment.

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REFERENCE

1. BUSCHKE, F., AND CANTRIL, S.: Irradiation Failures in Early Cervical Cancer. Improved Irradiation or Return to Surgery? Am. J. Roentgenol. 54: 60–69, July 1945.

Radium Treatment of Carcinoma of the Cervix Uteri[1]

JAMES F. NOLAN, M.D., WILLIAM E. COSTOLOW, M.D., and LUCILLE DuSAULT, A.B.

A CONCISE PRESENTATION of the role of radium in the treatment of carcinoma of the cervix uteri affords a difficult task; over-simplification of the problems involved may lead to dangerous rationalizations. Although the physical character-

[1] From the Los Angeles Tumor Institute, Los Angeles, Calif.

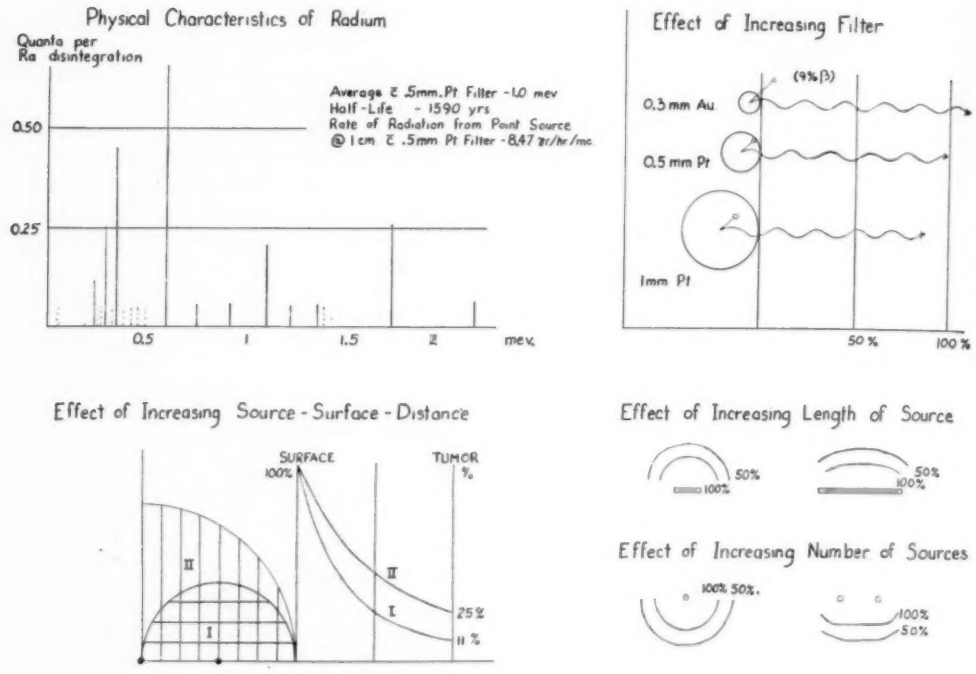

Figure 1

istics of radium as a source of ionizing radiations have been known for years, there have been many variations in the utilization of these principles in the technics of treatment. Moreover, the limitations imposed upon these technics by the various physiologic characteristics of the tumors themselves may limit their efficiency. Thus, many factors may complicate the evaluation of the results of treatment.

It will be the purpose of this essay to review the limitations, both physical and physiological, which may be imposed upon radium therapy in carcinoma of the cervix uteri; to compare basic technics which have been evolved; to present results of treatment by a standardized technic; and to evaluate these results upon the basis of dosage distribution alone. With such a presentation, it is obvious that all the clinical problems encountered in this disease will not be resolved. It is hoped, at least, that the necessity for further knowledge of its life history, and for further improvement in treatment technics, will be emphasized.

The basic tool utilized in the radium treatment of carcinoma of the cervix is the gamma radiation from the daughter products of the element (7). Figure 1 shows the proportion of these radiations in terms of their energies (4). Although there is a polychromatic distribution, the average wave length is 0.01 Å., and for practical purposes the radiation is considered uniform. The rate of decay may not be changed, so the product of the treatment time and the amount of radium expresses the exposure. Filtration may be used, primarily to insure the exclusion of beta radiation, but heavy filtration does not change the quality especially, merely decreasing the intensity of radiation.

Because of the small size of the usual sources of radiation, the inverse-square law becomes most important. Increases in the proportionate depth dose may be achieved by increasing the source-surface distance, but these advantages are limited by diminished returns so far as dose is concerned. Advantages may likewise be

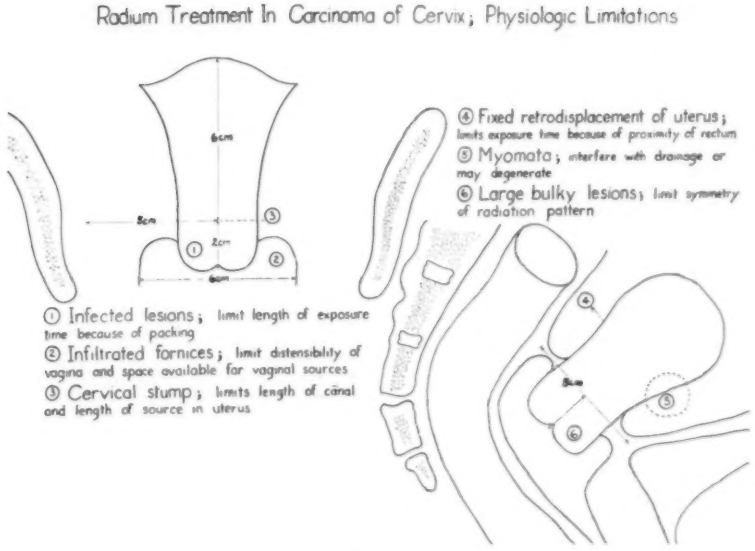
Radium Treatment In Carcinoma of Cervix; Physiologic Limitations
6cm
5cm
2cm
6cm
① Infected lesions; limit length of exposure time because of packing
② Infiltrated fornices; limit distensibility of vagina and space available for vaginal sources
③ Cervical stump; limits length of canal and length of source in uterus
④ Fixed retrodisplacement of uterus; limits exposure time because of proximity of rectum
⑤ Myomata; interfere with drainage or may degenerate
⑥ Large bulky lesions; limit symmetry of radiation pattern
5cm

Figure 2

gained by the use of multiple sources in optimum distribution, but here limitations are imposed by the lack of available space. By the use of elongated sources rather than short ones, the isodose contours may be made to approximate the geographical contours of the cavities, but here, too, spatial limitations come into play. In general, these principles are varied to achieve a uniform distribution of radiation throughout as large a volume of tissue as possible, without overdosage with its resultant necrosis on the one hand, and underdosage and its resultant ineffectual tumor control on the other.

The average geography of the cervix and its relationship to other structures are presented in Figure 2. These diagrams indicate the space available for the placement of radium sources. There are, however, natural variations in the size of the pelvis and its constituent organs in different individuals, and the tumors themselves may impose limitations upon the available space. Further limitations upon treatment methods may be imposed by the varying growth characteristics of the individual tumors. For instance, bleeding tumors must not be vigorously manipulated for fear of hemorrhage, and infected lesions must not be packed for long periods because of the possible spread of infection. Moreover, the condition of the patient in general oftentimes limits the efficacy of therapy. Aged and debilitated individuals cannot withstand strenuous radiation therapy or prolonged periods of immobilization. It is obvious that in radium therapy, as in any other means of treatment in medicine, it is necessary to individualize technics within the limitations of the host, the disease, and the means of treatment.

As far as technics are concerned, there has been a natural evolution in an attempt to provide a more and more uniform dosage distribution throughout the pelvis at efficacious levels and below the limits of dangerous overdosage. Figures 3 to 8 show some of these diagrammatically, with their resultant radiation distribution along a line at the level of the internal os in a midcoronal plane of the pelvis. These diagrams are based necessarily upon standard conditions, and the radiation distributions are the result of calculations and measurements for radium sources available to us.

One can see that the tandem alone is the simplest method of treatment, but it does

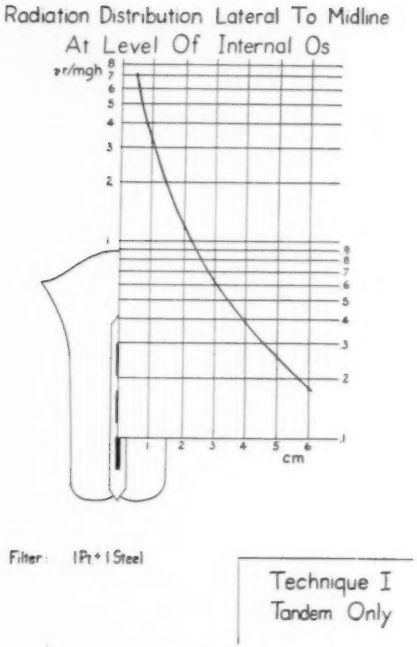

Figure 3

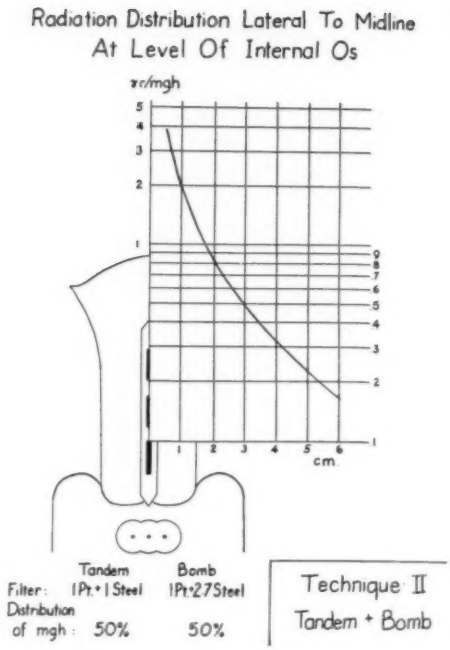

Figure 4

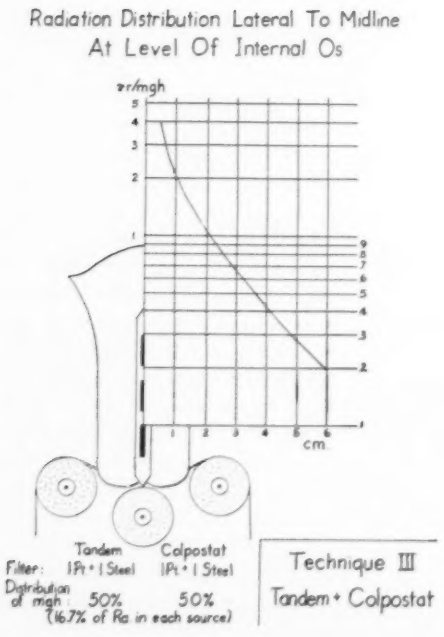

Figure 5

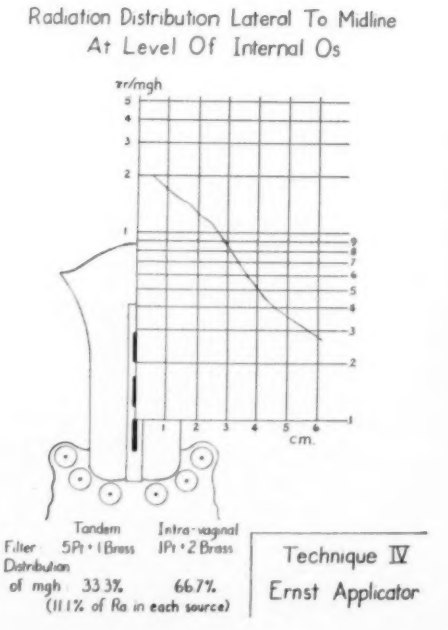

Figure 6

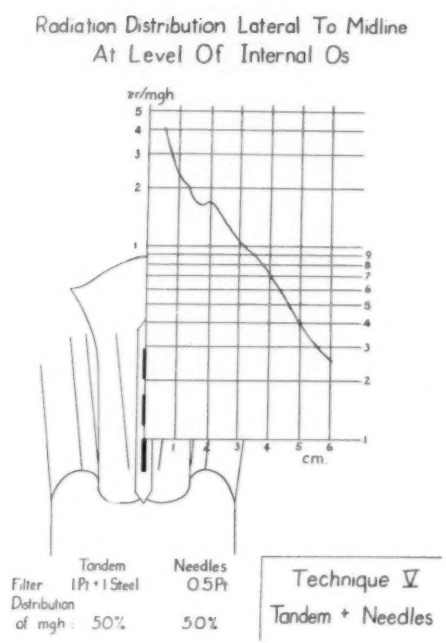

Figure 7

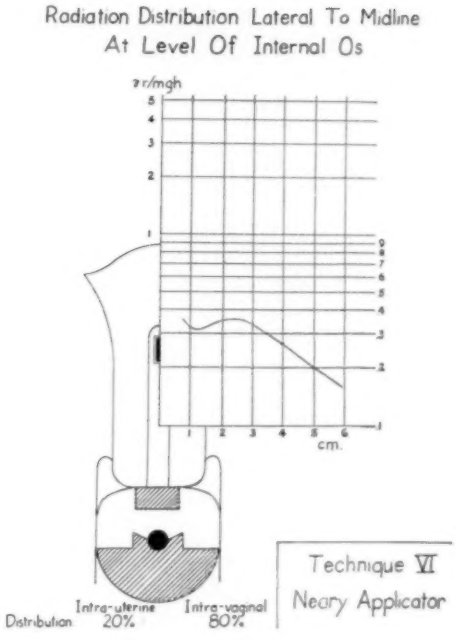

Figure 8

not utilize the available space in the vagina. The radiation distribution may be improved by the addition of a vaginal bomb, as in Figure 4 (2).

The method of treatment in most general use is presented in Figure 5—a tandem plus a few vaginal sources which tend to fill all the available space and utilize the advantages of an increase in the source-surface distance (11).

The Ernst applicator in Figure 6 shows the effect of abandonment of the source-surface-distance principle in favor of multiple vaginal sources in constant relationship with one another. This applicator becomes somewhat bulky and thus loses its adaptability to variable lesions (5).

Figure 7 shows the effect of complete adoption of the multiple-source principle in interstitial needles in combination with an intrauterine tandem (9). Although this method may be adapted to the individual characteristics of many lesions, there are operators who have discontinued its use because of fear of infections, fistulae, and other discouraging complications (10).

The Neary applicator was designed primarily on the basis of theoretical dosage distribution (8). It utilizes strong sources placed in the mid-line of the vagina and in the fundus of the uterus. Protection for the bladder and rectum is provided by heavy platinum shields. Although the dosage distribution is ideal so far as the pelvis is concerned, the use of this applicator has had to be discontinued because of frequent bowel injuries. This has been attributed to the proximity of loops of bowel to the single strong fundal source, and the applicator is now being redesigned (3).

Figure 9 presents a comparison among the six radium technics which have been diagrammed. Here again the graph shows radiation distribution lateral to the mid-line at the level of the internal os in the mid-coronal plane of the pelvis for the various methods of treatment, but certain theoretical limitations have been imposed upon these curves. If we may consider various amounts of gamma radiation in relation to their probable biological effects, we may

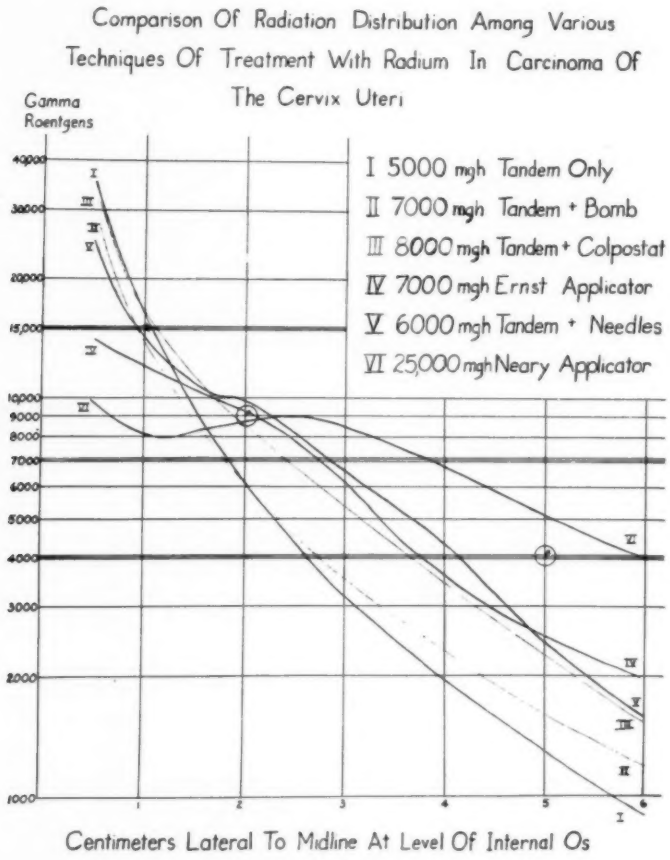

Figure 9

draw bands at certain levels to denote these areas. The dosages ranging between 1,000 and 4,000 gamma roentgens will be inadequate for tumor control. Those between 4,000 and 7,000 gamma roentgens may be effective. The range between 7,000 and 15,000 gamma roentgens has been taken as that which will control tumor cells without excessive destruction of the tumor bed, while the dosages falling above 15,000 gamma roentgens will probably cause necrosis of normal tissues. It is assumed that these doses are delivered in from four to six weeks.

Around any small source of radium there may be a few millimeters of tissue which will undergo necrosis, but in this graph an arbitrary figure of 10 mm. was taken, beyond which any necrosis was undesirable. This appeared to be the limiting point for exposure allowable by treatment methods I and II.

At a point 2.0 cm. lateral to the mid-line at the level illustrated, there has been denoted a "Point A." The dose here is considered an index of the amount of radiation delivered to the "paracervical triangle" of the British literature. An optimum dose of 9,000 ± 500 gamma roentgens for divided treatments in from three to four weeks has been stated by Margaret Tod (11). If we should use that dose at Point A for our comparison, we find that the interstitial needles and the Ernst applicator are limited as far as maximum exposure is concerned.

Carcinoma Of Cervix Uteri - Los Angeles Tumor Institute 1933 to 1944

I Usual Technique Of Treatment –

A. External X-rays: 1800r(air) To Each Of Four Pelvic Portals, 10 x 15 cm.
Factors: 450 Kv, 1mm. Pb. Filter, 50cm TSD 5mm Cu. H.V.L.
150 r(air) To 2 Portals Daily 1 T.E.D. ≙ 800r

B. Intacavitary Radium: Intrauterine Tandem: 2 x 25mgm Sources – 1mm Pt. Filter
5.5cm Length – 2600 mgm hr. Exposure
Intravaginal Bomb: 3 x 25 mgm Sources – 2mm Pt. Filter
1 x 2 x 3 cm. Dimensions – 2600mgm hr. Exposure
2 or 3 Treatments – 2 to 3 wks. Apart 1 T.E.D. ≙ 1000 r

C. Total Time Of Complete Rx. – 4 to 6 Weeks

II Results Of Treatment –

LEAGUE OF NATION STAGE OF DISEASE	NUMBER OF PATIENTS	PATIENTS SURVIVING - 5 YRS	
		NUMBER	PERCENT
I	188	137	73
II	191	96	50
III	179	50	28
IV	25	0	0
TOTAL	583	283	49

Patients Lost From Follow-up 18 Percentage Follow-up 96.9%

III Comparative Results In Five Year Survival Rates For Radiation Techniques-

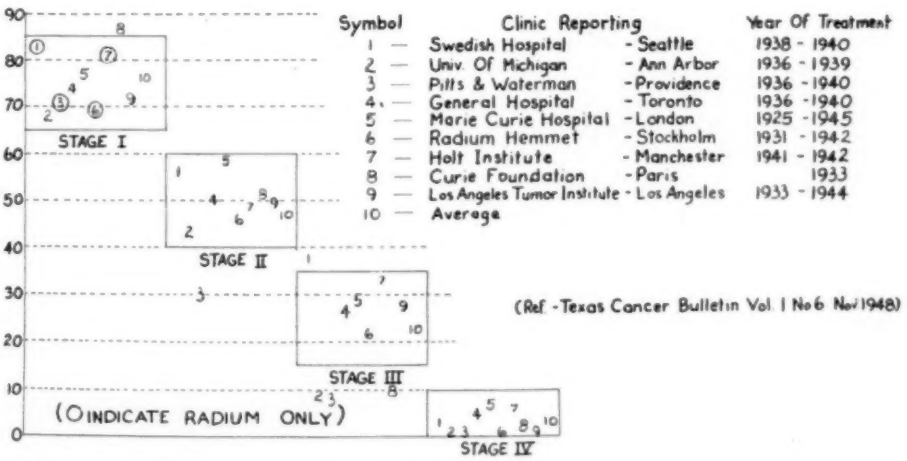
90
80
70
60
50
40
30
20
10
0
STAGE I
STAGE II
STAGE III
STAGE IV
(O INDICATE RADIUM ONLY)
Symbol Clinic Reporting Year Of Treatment
1 — Swedish Hospital - Seattle 1938 - 1940
2 — Univ. Of Michigan - Ann Arbor 1936 - 1939
3 — Pitts & Waterman - Providence 1936 - 1940
4 — General Hospital - Toronto 1936 - 1940
5 — Marie Curie Hospital - London 1925 - 1945
6 — Radium Hemmet - Stockholm 1931 - 1942
7 — Holt Institute - Manchester 1941 - 1942
8 — Curie Foundation - Paris 1933
9 — Los Angeles Tumor Institute - Los Angeles 1933 - 1944
10 — Average
(Ref. - Texas Cancer Bulletin Vol. 1 No 6 Nov. 1948)

Figure 10

Within these limitations the theoretical optimum exposures are calculated and are shown in terms of milligram hours. The exposure for the Neary applicator seems extremely high, but it must be remembered that the thick platinum filter and the cen-

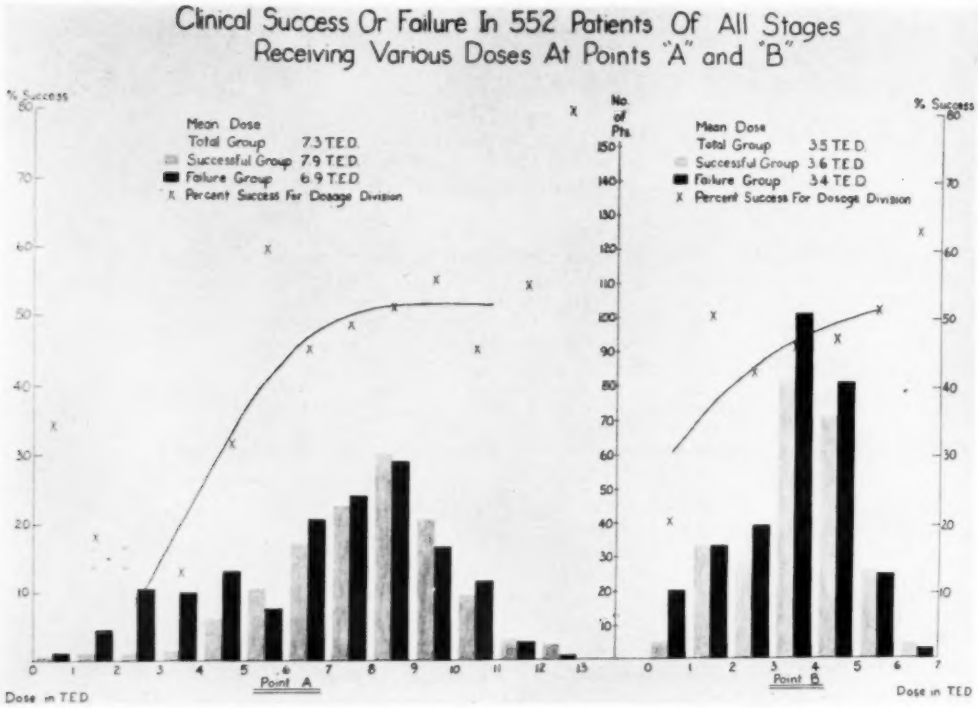

Figure 11

tral placement of the sources were utilized to achieve this distribution. The exposures for the other five technics vary between 5,000 and 8,000 milligram hours and appear to be remarkably similar to the exposures used in clinical practice with divided treatments.

There is another point of importance on a theoretical basis, 5.0 cm. lateral to the mid-line on the same axis. This is designated as "Point B," and is related to the lymphatic drainage field in the soft tissues adjacent to the pelvic wall. From the figure we can see that the amount of radiation from none of the technics, save the Neary applicator, reaches the 4,000 gamma roentgen level at that point. There is an increase in the amount of radiation reaching Point B with the improvement in technics, but it is a very minor one. The Neary applicator should be efficacious if it were not for its limitations from the standpoint of bowel injury. In other words, these methods alone are not efficient enough to control cancer cells in this area.

Figure 10 illustrates the usual radiation technic used at the Los Angeles Tumor Institute in carcinoma of the cervix uteri and the relative results of treatment. The 583 patients studied were those who had histological confirmation of the clinical diagnosis and who were subjected to primary treatment. Excluded from this study were 108 primary cases: 60 patients refused treatment or returned to the referring physician; 5 were referred elsewhere; 5 discontinued treatment, and 38 were considered too far advanced for treatment. The absolute five-year survival for all primary cases was 41 per cent.

The relative results may be compared to those of other clinics in relation to each stage of disease (6). Grossly, it appears that the results are similar, being: 75 ± 10 per cent for Stage I; 50 ± 10 per cent for Stage II; 25 ± 10 per cent for Stage III;

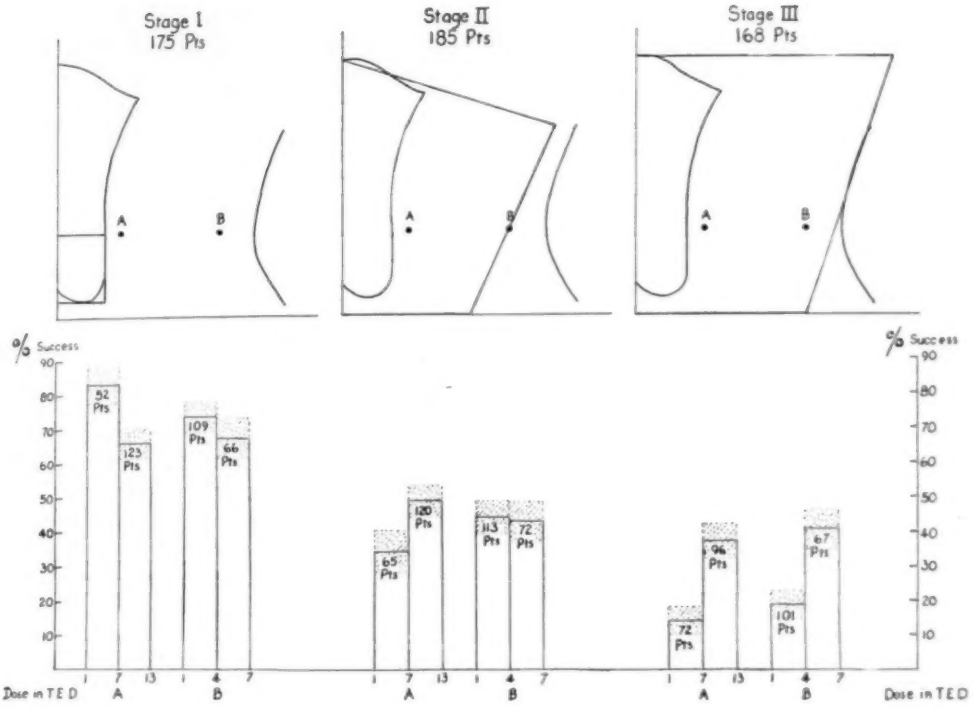

Figure 12

0 + 10 per cent for Stage IV. It would be important to know if these results could be improved by an improvement in dosage distribution with the development of better treatment technics.

The percentages of failure for each stage of the disease are quite similar to the percentages of cases showing lymph node involvement from operative or autopsy studies (1). The feeling has been expressed that radiation therapy will not control cancer cells that may have spread to lymph nodes deep in the pelvis. There is a tendency, therefore, to conclude that failure or survival in any case is dependent upon the possibility of lymph node involvement rather than upon the amount of radiation to which the patient has been subjected. This line of reasoning would be difficult to prove in human subjects without adequate biopsies of pelvic nodes before and after treatment by radiation. It would be valuable, however, to investigate this concept from a statistical point of view for, if results can be proved to be independent of the amount of radiation delivered, there may be some practical basis for its consideration.

In Figure 11 the patients receiving varying doses in T.E.D. at Point A and Point B are presented; success or failure of treatment is indicated. In order to draw conclusions from such a correlation, it was necessary to exclude patients whose records were incomplete as to the exact amount of treatment given or as to their exact status at the end of five years. That is, patients dying of intercurrent disease, or lost without evidence of disease before five years, were considered indeterminate. On the other hand, patients who were presumably free of disease at the end of five years but died within the next two years with evidence of disease were called failures because they probably were uncontrolled at five years.

The total group in which there was adequate information concerning dosage and final result numbered 552 patients representing all stages. The doses are expressed in T.E.D., using an 8 to 1 ratio between the supervoltage x-ray roentgens and the gamma roentgens. Inspection of the bar graphs indicating the number of patients receiving various doses at Point A and Point B shows a fairly uniform method of treatment, with the wider spread of dosage at Point A. There are relatively few patients in the groups receiving either extremely high or low doses. This is not surprising when one considers that these patients were not subjected to random irradiation, but that clinical judgment was exercised in the selection of treatment.

The bar graphs are divided to indicate the number of patients in the success and failure groups for each dosage division. From the number of failures in each group it is at once apparent that results are not a function of the dose delivered to the parametrium alone. However, the percentage of success for each division may be indicative of some relationship. The cross marks indicate the percentage of successes for each division of dosage in units of 1 T.E.D. at "Point A" and "Point B." At first glance, the points shown have a random distribution, but they may be subjected to interpretation as follows:

If the groups in the extreme ranges of dosage be excluded because of the small number of patients in those divisions, the others may be correlated with a continuous line. Such an arbitrary curve has been drawn through the percentage points for each group numbering 20 or more patients. The curve is necessarily incomplete because of the lack of adequate numbers of patients subjected to the extreme ranges of dosage and a definite minimum or maximum dose is absent. An optimum dose must therefore be absent also. It appears, however, that doses in the range between 7 to 11 T.E.D. at Point A have given the best results, and this is in fair agreement with Tod's conclusions.

At least from the direction of the curves there is a definite indication of improvement in results with an increase in dose to the parametrium. This direction toward improvement is enough to indicate some dependence of results upon the amount of radiation delivered and therefore nullifies, to a certain extent, the contention that results are entirely dependent upon some other condition. To be sure, there are other factors influencing prognosis which should be evaluated in the light of the amount of radiation to which the patient was exposed.

Figure 12 presents a series of similar bar graphs recognizing the clinical factor which has the most prognostic significance in this disease, namely, the gross involvement. One can see from inspection of the data presented that the number and distribution of patients receiving varied doses are much the same for Stages I, II, and III, both at Point A and Point B. In other words, a rather standard technic was used for most patients without regard to stage of disease. Such a distribution brings out the differences in results among the three stages, with the obvious superiority of treatment in the early stages. On the other hand, this tendency again results in few patients being subjected to the extremes of high or low dosage and makes direct correlation of results with dosage within each group fairly difficult. However, if we should subject these results to the same criteria as were used in the theoretical consideration of various methods of treatment, we may not be in error. These criteria have been found to agree with the over-all results presented in the preceding graphs and with the experience of others.

When one considers the percentages of successful results within the theoretical optimum dosage range of 7 to 13 T.E.D. at Point A for Stage I in comparison to lower doses, a tendency toward improvement with lower dosages seems to appear. This is in an opposite direction to the same comparison in Stage II and still more so in Stage III, where a more definite improvement in results appears with increased dosage at this point. At Point B the

difference is most obvious when one compares percent survival with doses below 4 T.E.D. to that with doses between 4 and 7 T.E.D. in the advanced stage of the disease.

From study of the graphs, one can make observations that may have some clinical importance. The lack of improvement with increase in dose in Stage I makes one suppose that the possibility of lymph node involvement is less deleterious to results than overdosage in the region of the parametrial triangle. This is often stated by the Manchester group, who advocate the use of radium alone in the treatment of the early stages of the disease. There has been a similar philosophy in the treatment of early stages of other more accessible squamous-cell carcinomata. Prophylactic radical node dissections are being performed less frequently. It may be that radical radiation therapy of prophylactic nature should be withheld in this disease, also. The difficulty, of course, lies in the fact that early involvement of nodes deep in the pelvis cannot be ascertained as easily as in the neck or the groin.

In cases classified as Stage II, where the disease has probably reached Point A, but has only possibly reached Point B, the bar graphs indicate that it is necessary to irradiate Point A rather vigorously, but the variation in per cent of successes with high or low dosage at Point B is not significant.

The over-all percentage of survival in Stage III, where both Points A and B are probably involved, is much less than in the others. The bar graphs show, however, that the dose must be adequate at both points, since the necessity for complete treatment probably outweighs the deleterious effects of high dosage *per se*.

It may be that the numbers of patients in all of these groups are too scanty for unassailable conclusions, but significant variations are indicated by the standard deviations for each group. In Stage III at Point B the difference in results is significant at the 1 per cent level, being 21.5 $\pm$ 7.1 per cent. This is enough to indicate a dependence of result upon the amount of radiation delivered to the node-bearing areas when they are involved by disease. Therefore, the concept of the ineffectiveness of radiation therapy in the treatment of involved pelvic lymph nodes is further questioned.

SUMMARY

Despite the fact that, for many years, radium therapy has been the method of choice in the management of patients having carcinoma of the uterine cervix, there are very apparent limitations to the number of survivors as well as to the theoretical efficiency of the treatment technics. However, at our present stage of knowledge it would probably be as unwise to abandon radium technics because of their inadequacy as it would be to be satisfied with the over-all results of treatment. There is a need for constant effort toward improvement in treatment methods which may be translated into improved control of the disease in the future.

REFERENCES

1. ARNESON, A. N.: Rationalization in Treatment of Cancer of the Uterine Cervix. Chicago M. Soc. Bull. **51:** 413–416, 1948.

2. COSTOLOW, W. E.: Management of Stage I Carcinoma of the Cervix Uteri. Ann. West. Med. & Surg. **2:** 506–509, 1948.

3. DONALDSON, MALCOLM: Personal communication, 1948.

4. EVANS, R. D.: Radioactivity Units and Standards. Nucleonics 1947.

5. ERNST, E. C.: Probable Trends in the Irradiation Treatment of Carcinoma of Cervix Uteri with Improved Expanding Type of Radium Applicator. Radiology **52:** 46–58, 1949.

6. FLETCHER, G.: Radiotherapy. Texas Cancer Bull. **1:** 144, 1948.

7. GLASSER, O., QUIMBY, E. H., TAYLOR, L. S., AND WEATHERWAX, J. L.: Physical Foundations of Radiology. New York and London, Paul B. Hoeber, Inc., 1944.

8. NEARY, G. J.: Physical Aspects of Intracavitary Radium Treatment of Carcinoma of the Cervix Uteri. Part III. A New Applicator. Brit. J. Radiol. **20:** 454–469, 1947.

9. NOLAN, J. F., AND QUIMBY, E. H.: Dosage Calculations for Various Combinations of Parametrial Needles and Intracervical Tandems. Radiology **40:** 391–402, 1943.

10. TAYLOR, HOWARD C., JR., and TWOMBLY, GRAY H.: Cancer of the Cervix: A Study of the Effect of Interstitial Radon Needles as Compared with Roentgen Therapy Given Through Intravaginal Cones. Am. J. Roentgenol. **56:** 513–522, 1946.

11. TOD, M. C.: Optimum Dosage in Treatment of Carcinoma of the Uterine Cervix. Brit. J. Radiol. **14:** 23–29, 1941.

Roentgen Treatment of Cancer of the Cervix[1]

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AS IN CANCER IN the other sites of the body, the treatment of cancer of the cervix has two phases: (1) treatment of the primary tumor and its extensions in the paracervical tissues. (2) treatment of more distant extensions and metastases in the lymph nodes. For both phases, the possibility of cure is based on delivery of a tumor control dose to the whole tumor-bearing area. It is a problem of physics on one side, and of the biological and clinical effects of irradiation on the other. The adequate dose to control a tumor is not the same for its various parts, and is not the same for the metastatic nodes. It is never an absolute figure, and any statement made about lethal or sterilizing dose always implies one which will cure a percentage of tumors and that is about the maximum which the healthy tissues can tolerate. In this concept one must always remember the importance of the time factor.

The tumor control dose must be delivered to the whole tumor, and it is not adequate, therefore, to calculate it at one point or even at several points, except if they are representative of maximum and minimum tumor dose areas. Certain areas are included within curves of higher dosage giving the maximum tumor dose; the whole tumor is included within curves of lower dosage giving a minimum tumor dose (Fig. 7).

Such a volume distribution should be made routinely in the planning of x-ray therapy. With the use of radium sources, one can determine isodose surfaces inside of which the dose is at least equal to the dosage on the surfaces. For interstitial radium implantations, if they are done according to the rules, calculations give the minimum tumor dose.

A great deal of information has been obtained on the tumor control dose for primary neoplasms, both for radium and roentgen rays. Clinical experience has shown that 6,000 to 8,000 r_γ, in less than two weeks, is a tumor control dose for a high percentage of squamous-cell carcinomas and that 6,000 r, delivered in five to six weeks, is also adequate. Although there is a lack of unanimous opinion on the radiosensitivity of adenocarcinomas, some extensive and thoroughly studied series seem to indicate that the moderately sensitive ones respond to a comparable dosage.

Unfortunately, much less is known about the radiosensitivity and curability of metastatic nodes. The well established value of the radical neck dissection has justifiably prevented extensive series of x-ray therapy for operable nodes, and in most of the cases so treated the nodes have been large and fixed, with the possibility of cure greatly diminished. When small or moderately enlarged palpable nodes have been treated at the same time as the primary lesion, a positive biopsy of the nodes has not been obtained in most instances, as the habit of using punch biopsies is relatively recent and has not yet met with widespread approval. The methods of treatment have also been varied and quite often involved various stages, so that the tumor dose is not even known with approximation. All that one can say is that it seems that metastatic nodes are probably more radioresistant, but that some can be sterilized.

From the study of some series published by the proponents of teleradium therapy (18, 8), it seems that one can sterilize a certain percentage of metastatic nodes with around 6,000 r_γ given in three to six weeks. Because of lack of positive biopsies, the exact percentage could not be stated, as a number of enlarged nodes are inflammatory.

Even less is known about the radiocur-

[1] From the University of Texas, Houston, Texas.

ability of metastatic nodes in the pelvis. The only series which indicates a possible response is the one of Morton (10), in which the percentage of node involvement without irradiation was 35.4 against 11.4 with preoperative irradiation. Actually, studying the radiotherapeutic technic, one does not see too well how these nodes would have been sterilized, as the dosage was cases. Lateral to this is a paralethal zone where the dosage is not enough to control a high percentage of squamous-cell tumors, and further laterally the dose is wholly inadequate. It has been shown by Meredith (9) that grossly 1,000 r_γ are delivered to point B (Fig. 5) for each 4,400 mg. hr. The other points along the pelvic walls, where nodes are found, receive less.

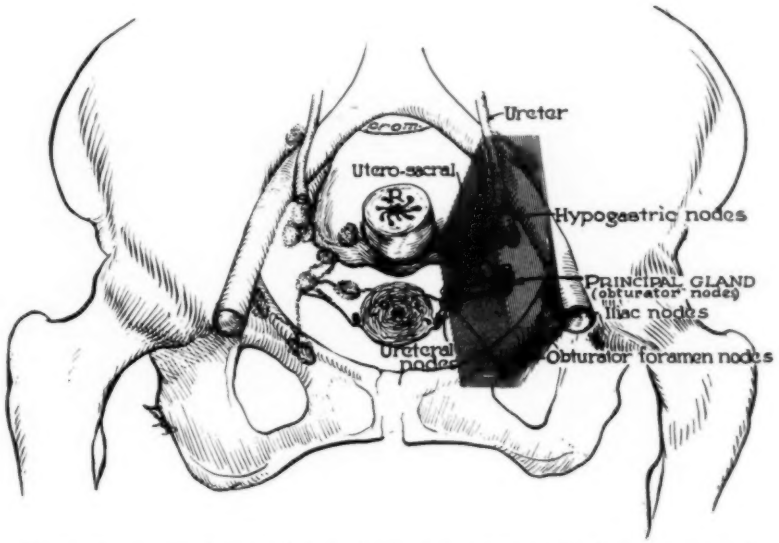

Fig. 1. Perspective drawing of the nodes on the pelvic wall. Various groups of nodes from the obturator foramen nodes anteriorly to the hypogastric and uterosacral nodes posteriorly are included in a rectangular cuboid adjacent to the pelvic wall. The anteroposterior length is about 10 cm. and the depth 5 to 7 cm. The base of the cuboid is at least 50 sq. cm.

much lower than what is considered to be cancerocidal.

PURPOSE OF EXTERNAL IRRADIATION

Either radium or intravaginal therapy, correctly applied, can control the primary cervical lesion, extensions to the fornices, and lateral extensions of the tumor up to a certain distance from the mid-line. That distance varies with the type of applicators, the distribution of the radium sources, and the total number of milligram hours.

The study of the volume distributions shows that there is a lethal zone within which the radium alone is sufficient to control the tumor, except in unusually radioresistant

The possibilities and purpose of external irradiation have to be well understood. As the primary tumor can be adequately handled by intracavitary therapy, the aim is essentially to supplement the radium dosage in the paralethal zone (to bring it up to an adequate level) and, if possible, to supply the main treatment to the lateral aspects of the parametrium and the pelvic nodes, as these cannot be irradiated by any other means.

This calls for discussion, as attempts have been made to irradiate the pelvic wall by angulated intravaginal beams and interstitial radium implantation. If one realizes that the pelvic nodes are distributed in a rectangular cuboid (Fig. 1), the base of

which is about 50 to 60 sq. cm., one sees that even in the most ideally duplicated angulation of transvaginal cones, only a small surface will be covered (20 sq. cm. at the most) and that the depth dose at this level could not be more than about 1,500 r (15).

The use of interstitial needles in the parametrium offers greater possibilities. The results obtained by Waterman (16), in more advanced stages (Schmitz III and IV), however, are no better than those

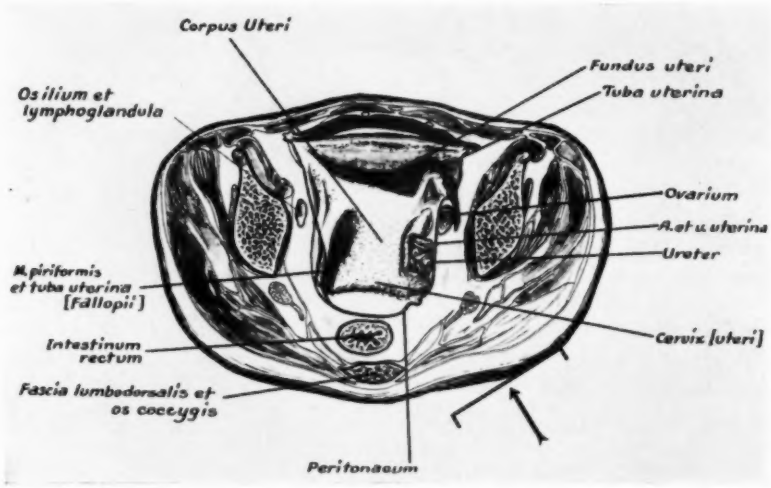

Fig. 2. Drawing of Section 45 from Eycleshymer and Schœmaker's "A Cross-Section Anatomy," at the level of the fourth sacral segment. The posterior fields with their lower margin at the level of the dentate line have their center at about this level. One sees that there is very little compression possible if one uses straight posterior fields close to the midline. The maximum thickness of soft tissue is oblique, and by compression the applicator is brought closer to the parametrium and cervix. There is very little bone in the beam of rays. The drawn line shows a 7-cm. wide portal 4.5 cm. from the mid-line and the arrow the direction of the central axis. (Reproduced by the courtesy of Appleton-Century Co.)

obtained by intracavitary radium applications with even a small amount of external irradiation added (4). Attempts at better disposition of the radium needles have been made by Corscaden (3), who claims that he can deliver very high dosages to the pelvic wall. It should be remembered that even when anatomical control is relatively easy, as in head and neck work, a correct geometrical positioning of the needles is difficult, and it has been shown repeatedly that, without such a regular pattern, results are poor. This, obviously, is to be expected, since under these circumstances there are points which are decidedly underdosed. At all events, further studies with either radium or cobalt needles are surely worth while.

If one wants to get within the range of effective irradiation, a minimum tumor dose of at least 5,000 r must be delivered to the node-bearing area, added to whatever is received from radium (1,000 to 3,000 r_γ). Below that level, radiation is obviously inadequate and could at the best sterilize an occasional metastasis. The classical technics using four portals, two anterior and two posterior, 15 × 10 cm., with an air dose varying from 1,600 to 2,400 r (depending upon the size of the patient), will deliver about 2,000 r tumor dose. The addition of lateral portals (1, 12) may raise the level on the lateral pelvic wall up to 3,000 r, but it is at the expense of a great increase in the integral dose, and also increased dosage to the midline.

Cantril (2), who has used 800 kv. and given 3,500 r to four portals, 14 × 10 cm.,

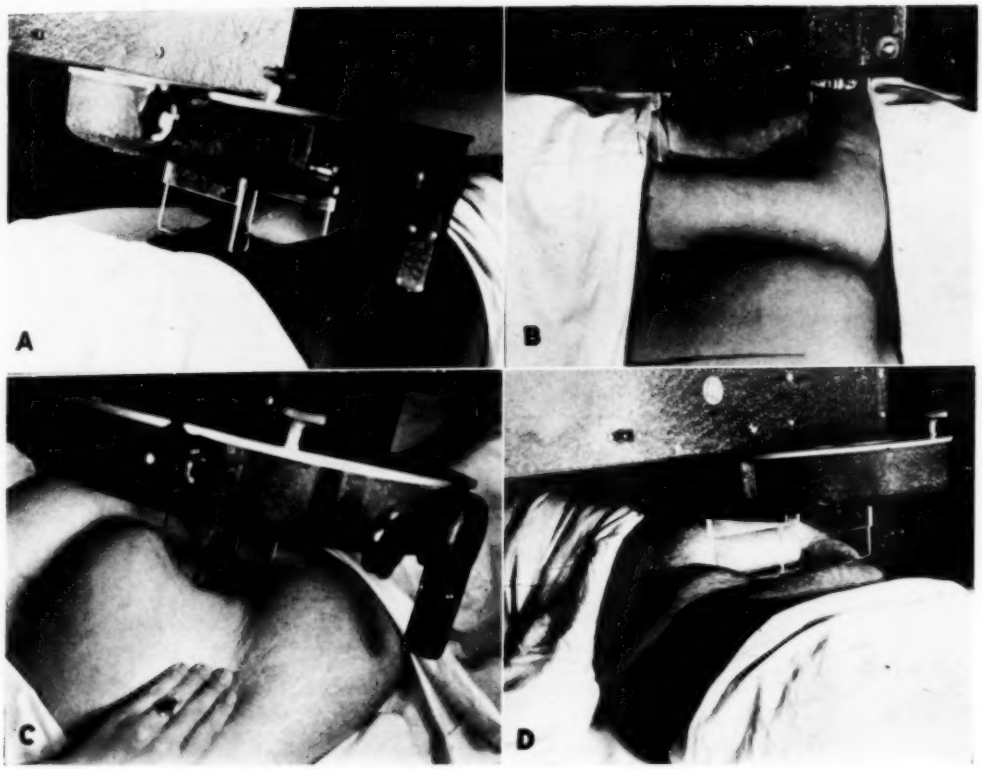

Fig. 3. Compression obtained: A. 12 × 8 cm. anterior portal, 3 cm. compression. B. Posterior oblique portal, 5 cm. compression. C. Gluteal portal, 7 cm. compression. D. Anterior portal, 12 × 14 cm. (to be used with central lead strip) 6 cm. compression. The surface of the cone is S-shaped (see Fig. 4B).

states that a tumor dose of 3,500 r is delivered in an average-sized pelvis of 20 cm. anteroposterior diameter. The combined contribution of 8,000 mg. hr. radium with roentgen rays brings the total dose to 4,500 r. Cantril states that, from experience with other epidermoid lymph node metastases, one can hardly expect sterilization with such a dose. He adds that a further increase of this dose cannot be achieved without severe complications involving the bowels and vascular connective tissues.

PRINCIPLES OF THE TECHNIC USED

In order to avoid complications (colitis, cystitis, etc.), the mid-line and paracervical tissues should never be in the beam of external irradiation, once they have been adequately irradiated with radium. To insure this requires knowledge of the radium volume distribution so that the x-ray fields can be planned to supplement the radium outside of the lethal zone (6). The fundamental principle is the use of fields as small as possible, as this is the only way that one can increase the amount of irradiation without too great danger. This necessity of keeping down the total volume of tissue irradiated is borne out by the factors which determine the tolerance to irradiation.

COMPRESSION

An essential part of the technic is the use of compression cones. Without compression, one cannot get a worth-while depth dose in women even moderately fat. This can be demonstrated by ionization chambers in the vagina or by calculations based on isodose curves.

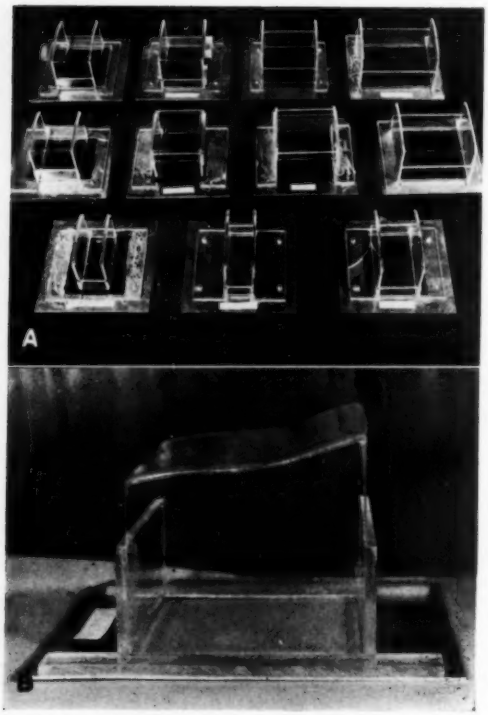

Fig. 4. A. Set of plastic cones adaptable to the light centering device. The surface of the applicator is either slightly convex or S-shaped.

B. Cone with an S-shaped surface. The convex edge rests on the symphysis so that the other protruding edge gives 4 to 7 cm. compression to the abdomen. For the sacral fields, the protruding edge compresses the buttocks, while the convex surface fits the upper sacral curve.

A cross section of the pelvis at the level of the middle of the portals shows that the maximum thickness of soft tissues is not straight posteriorly for the posterior portals (Fig. 2). Rather, the maximum thickness occurs obliquely, and the beam at this site goes principally through the sciatic notch, sparing the rectum and traversing little bone.

With applicators 7 to 8 cm. wide one can gain, through the use of compression and depending upon the body build of the patient, 2 to 6 cm. on the anterior portals and 4 to 6 cm. on the posterior oblique portals. Calculations from isodose curves show a net increase of 25 to 45 per cent over the depth dose without compression for the anterior fields, and 35 to 55 per cent for the posterior oblique fields. Measurements with ionization chambers in the vagina have verified these calculations.

In the planning of treatment to the parametrium, considerable compression is obtained on anterior, sciatic, and gluteal fields (Fig. 3), but little is accomplished on the sacral fields, and none on the perineal.

FACTORS

In our institution, we use a 400-kv. machine, equipped with a light centering device, for the external irradiation of gynecological carcinomas. The filter used is a Thoraeus 3 mm. Cu equivalent, giving a h.v.l. of 4.2 mm. Cu, and the skin reactions referred to in this paper are for that particular quality of radiation. A set of plastic cones (Fig. 4), adaptable to the light centering device, has been made. With these cones the focal skin distance is 66 cm.

REGIONS TO BE TREATED BY EXTERNAL IRRADIATION

In cancer of the cervix the regions to be treated by external irradiation are the lateral aspects of the broad and uterosacral ligaments, and the four main groups of nodes along the course of lymphatic spread on the pelvic wall. These nodes are the hypogastric at the bifurcation of the common iliacs, the external iliac nodes along the pelvic brim, the nodes close to the obturator foramen, the "principal gland" (or obturator node) along the lateral pelvic wall, half way between the hypogastric nodes and obturator foramen (5 to 5.5 cm. from the midline at the level of the internal os). The presacral nodes, which are further away, should also be included, although it is doubtful that they can be adequately treated with any technic. Figure 5 shows the paracervical triangle as well as other points which are important in planning treatment. Point A is at the intersection of the ureter and the uterine artery where the ureteral node is located. Point B is on the muscular pelvic wall 5 cm. from the midline, and here the "principal gland" is found.

In the treatment of the pelvic nodes, one

must keep in mind that the region to be treated is not a small area, 5 to 6 cm. laterally at the level of the internal os, which covers the "principal gland," but rather a rectangular cuboid (Fig. 1) elongated anteroposteriorly, about 10 cm. in length and 5 to 7 cm. in height, which includes the hypogastric, uterosacral, and external iliac nodes, and the "principal gland," as well as the obturator foramen nodes. In correct planning, one should deliver a homogeneous irradiation to a slab of tissue from the sacroiliac joint to the obturator canal.

Fig. 5. Point A (2 cm. from the mid-line, 2 cm. from the external os) is at the crossing of the ureter with the uterine artery; the ureteral node is located here.
Point B (5 cm. from the mid-line at the same level as A) is on the muscular pelvic wall; the "principal gland" group is located here.

It is important to appreciate this three-dimensional distribution of the pelvic nodes, since calculations which take into consideration only point B might not be adequate for the nodes located anterior or posterior to it. It is true that this group of nodes at point B is quite commonly involved, but the whole area should be adequately treated. This is also important in evaluating the oblique fields used in certain intravaginal technics.

Only technics using external irradiation can irradiate homogeneously the lateral aspect of the broad and uterosacral ligaments and the whole node-bearing area. There is no reason to believe that metastatic nodes from epidermoid carcinoma

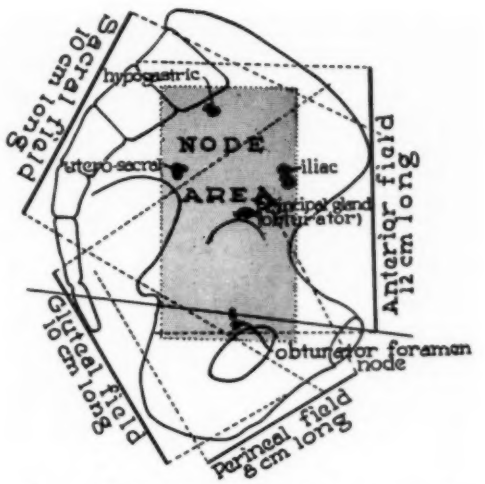

Fig. 6. Showing the node area in the sagittal plane and how the parametrial portals cross-fire it. The anterior port is 12 cm. long, the sacral and gluteal 10 cm., and the perineal 7 to 8 cm.

of the cervix are more radiosensitive than those of similar tumors of the head and neck. Then, in order to be in the range of tumor control, at least 6,000 r should be given by external irradiation in six to eight weeks in addition to the 1,000 to 3,000 r_γ contributed by radium.

If radium therapy is used, methods (6) are available to determine the distribution of ionizing energy around the radium sources. One can then outline x-ray fields which will supplement the dosage in the area beyond the lethal zone of radium. The zone which has already been adequately treated, and to which any added radiant energy would only increase the danger of necrosis, would then not be over-irradiated.

A homogeneous irradiation of the node area can be obtained by cross-firing through anterior, perineal, gluteal, and sacral fields (17). Figure 6 shows the geometrical relationship of these fields to the node area. The anterior fields are 12 cm. long and 4 to 6 cm. wide, the gluteal and sacral 10 cm. long and 4 to 6 cm. wide, with a 20-degree tilt to the feet for the sacral, and 35 to 40-degree tilt to the head for the gluteal. The distance from the mid-line varies from 2 to 3.5 cm., depending upon

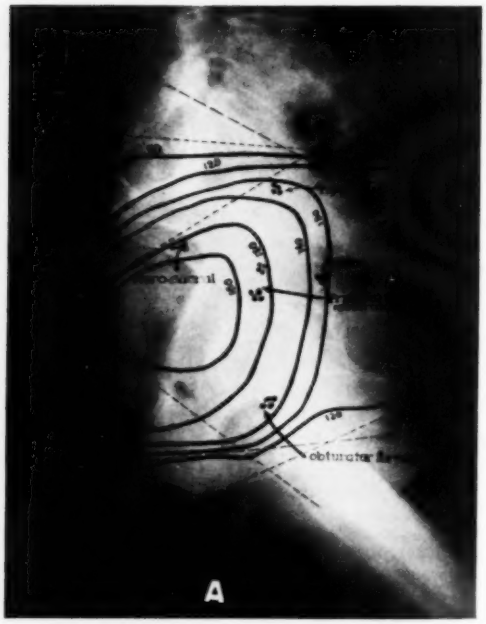

Fig. 7. A. Volume distribution (for a patient of 20 cm. anteroposterior diameter) with an arrangement of anterior (12 × 5), sacral, gluteal and sciatic (10 × 5) fields, magnified and traced on a lateral film of the pelvis. The "principal gland" and part of the hypogastric nodes are inside the 150 curve. The whole node area is included in the 130 curve. For a skin dose of 4,500 r to the four fields, the maximum tumor dose is 4,500 × 1.5 = 6,750 r; and the minimum tumor dose is 4,500 × 1.3 = 5,850 r.

the width of the lethal zone from the radium. The upper margin of the gluteal field is at the level of the sacrococcygeal joint, and the lower margin of the sacral 2.5 cm. above. The perineal portals are about 7 × 4 cm., 2 to 3 cm. on each side of the vulva, directed through the obturator foramen. From three to five of these parametrial fields are used on each side, depending upon the findings on pelvic and rectal examination and the thickness of the patient. In thick patients, four fields are necessary to build up a lethal dose. Doses of 300 r (air dose) for portals 6 cm. in width in thin patients (16 to 17 cm. anteroposterior diameter) to 400 r for portals 4 to 5 cm. in width (anteroposterior diameter of at least 18 cm.) can be given daily to two portals. Bladder and rectal reactions are minimal in the great majority of cases even though 4,000 r (4,500 r skin dose) are administered. The skin reaction in such instances is, at the most, a partial moist desquamation which heals in a few weeks.

The tumor dose in an average size patient of 18 to 20 cm. anteroposterior diameter, varies between 130 and 160 r for 100 r (skin dose) to each field (Fig. 7), with an average of 150 r in the region of point B. For 4,000 r air dose in six to eight weeks (4,500 r skin dose), the maximum tumor dose is around 7,000 r and the minimum tumor dose around 6,000 r. For a greater tumor dose the integral dose is about one-third (10.68 mg-r)[1] of the integral dose (29.12 mg-r) for a 15 × 10-cm. six-field arrangement. This allows one to give 4,000 r (air dose) to all the fields without even taxing the systemic tolerance.

Due to old inflammatory conditions or the neoplasm itself, there is often a displacement of the uterus and one fornix to one side with a resulting asymmetry of the radium volume distribution (13, 17). The parametrial portals should be planned symmetrically in relation to the sagittal plane passing through the center of gravity, S, of the radium sources. The width of these portals will then be different on each side in order to cover the zone which extends from the volume adequately treated by radium to the pelvic wall (Fig. 8).

To save time on the machine, the anterior and sacral fields can be irradiated (14) by a single cone 14 cm. wide with a lead strip from 3 to 5 cm. wide (Fig. 9), the mid-line in which is placed above the center of gravity, S, of the radium sources. An occasional drawback is that, due to the larger surface of the applicator, the compression is not always as good as with a narrow applicator.

In the moderately sensitive tumors, only limited volumes can be given a tumor control dose, and it is not possible in most instances to deliver such a dose to all potential areas of spread. In concentrating where the disease is surely present, one will cure a certain number of cases.

If one side is clinically involved and the

[1] The unit used is the "megagram-roentgen" (mg-r) *i.e.*, one million gram-roentgen.

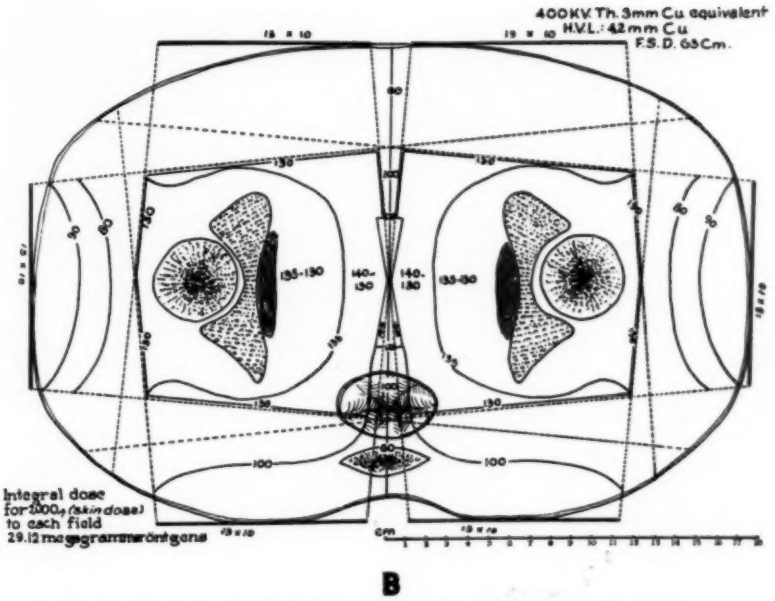

Fig. 7. B. Volume distribution for six-field arrangement, 15 × 10 cm. The integral dose for 2,000 r (skin dose) to eight fields is 10.68 mg-r against 29.12 mg-r for the six 15 × 10 cm. field arrangement.

other free from disease, the dosage can be carried to a higher amount (1,000 r to 2,000 r greater tumor dose) on the involved side. This can be accomplished either by planning more portals on the involved side, or by a higher dosage to the portals. One may give then up to 5,000 r (5,750 r skin dose) to each of the parametrial portals.

PHASES IN THE PLANNING OF EXTERNAL IRRADIATION

The arrangement of fields may vary in the same case during the different phases of the treatment in order to deliver a tumor control dose to the whole tumor-bearing area.

The aim is to deliver to the node area a minimal tumor dose of 5,000 r and at least 6,000 r at point B. In patients of 16 to 18 cm. anteroposterior diameter, this can be achieved with anterior, sacral, and gluteal fields. From 19 to 22 cm., sciatic or perineal portals, or both, have to be added. Above 22 cm., only smaller tumor doses can be given, which are below what is needed to sterilize an appreciable percentage of metastatic nodes, if one goes by the experience acquired in head and neck tumors.

In patients of average size who have received 6,000 to 7,000 mg. hr. of radium, portals 6 cm. wide, 2 cm. from S, are first outlined and 2,000 r (air dose) are delivered; the minimum dose is around 3,000 r. The portals are then narrowed to 4 cm. wide, 3 cm. from S, and another 2,000 r are given, to deliver a minimum dose of 5,000 r. There is usually no systemic or rectal reaction and only mild frequency of urination. If the number of milligram hours of radium is increased, the portals may be 5 cm. wide (8,000–9,000 mg. hr.) or even 4 cm. wide (over 9,000 mg. hr.) from the beginning of the x-ray treatment (Fig. 10).

In this manner, 7,000 or 8,000 r_γ (two weeks) will be delivered to the zone receiving a lethal dose from radium; the paralethal zone will receive from 4,000 to 7,000 r_γ plus around 3,000 r from x-ray in about four weeks; the lateral portions of the parametrium and pelvic wall will receive from 1,500 to 3,000 r_γ depending upon the

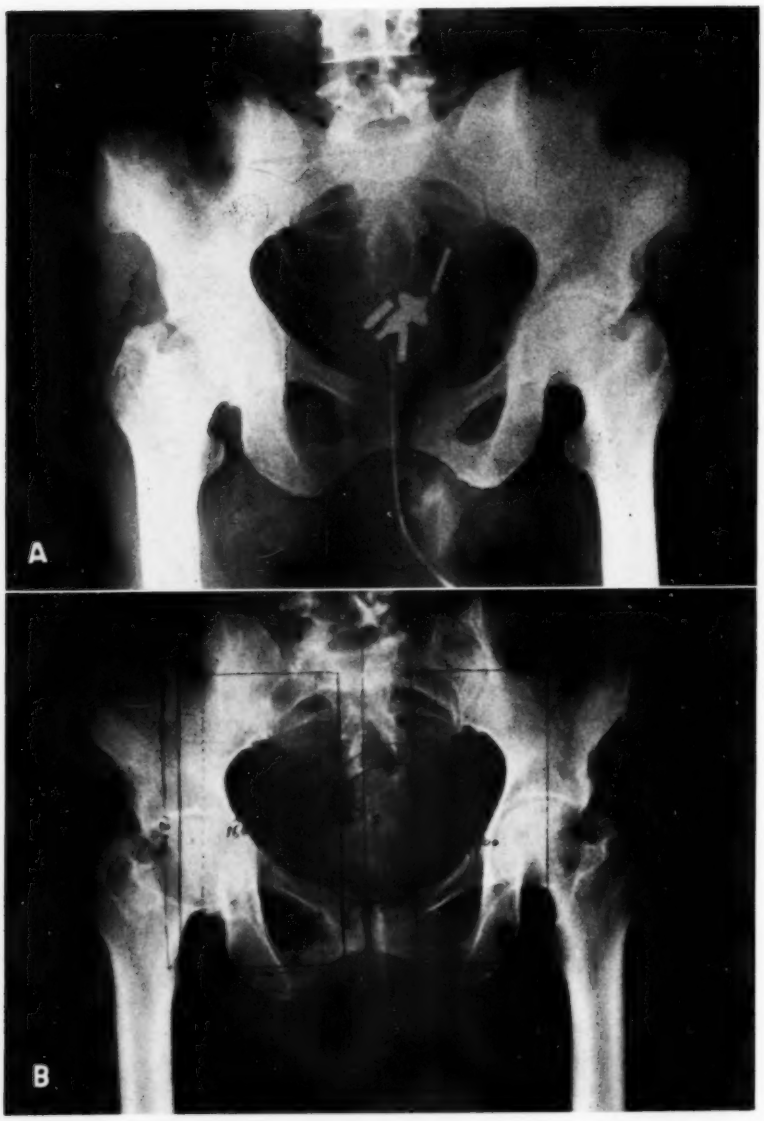

Fig. 8. A. Film of the patient with radium applicators *in situ*.
B. The dosage distribution from radium has been calculated by the method described by Lederman and Lamerton (6). The center of gravity (S) of the radium sources is slightly displaced to the left, and the planning is made accordingly. Fields 12 × 6 cm. on the right and 12 × 5 cm. on the left to 2 cm. from S are outlined. After 2,000 r (air dose), the fields are narrowed to 4 cm. wide, each 3 cm. from S, and another 2,000 r are given. The drawing takes into account the magnification and the true size of the cross section of the beam by the sagittal plane at the level of the broad ligaments.

applicators used and the total number of milligram hours of radium employed, plus 5,000 to 6,000 r (six to eight weeks) from external irradiation.

If one chooses to give external irradiation prior to radium, in order to shrink a large cauliflower tumor or cut down infection, a tumor dose of 1,500 to 2,000 r may be de-

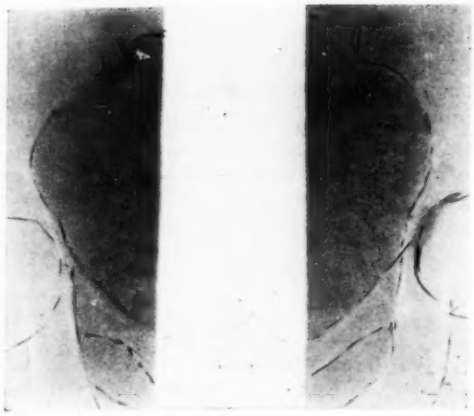

Fig. 9. Applicator 12 × 14 cm., with a central lead strip 4 cm. wide. The center of the lead strip is placed over S (see Fig. 8B).

livered before the radium implantation. A smaller amount of radium is given, and then, after radium therapy, small narrow fields are again used to treat the parametrium in order to build up the dose to a tumor-control level. In this instance, the parametrial dose is already 1,500 to 2,000 r from the pre-radium treatment and the post-radium therapy will be given accordingly, that is to say, fields 5 or even 4 cm. wide are used from the beginning and the total dose to the pelvic wall is brought to 6,000 r.

The over-all time of treatment is eight to nine weeks. In that period the pelvic wall in the region of the "principal gland" will receive 1,500 to 3,000 r_γ from radium and 6,000 r from x-rays.

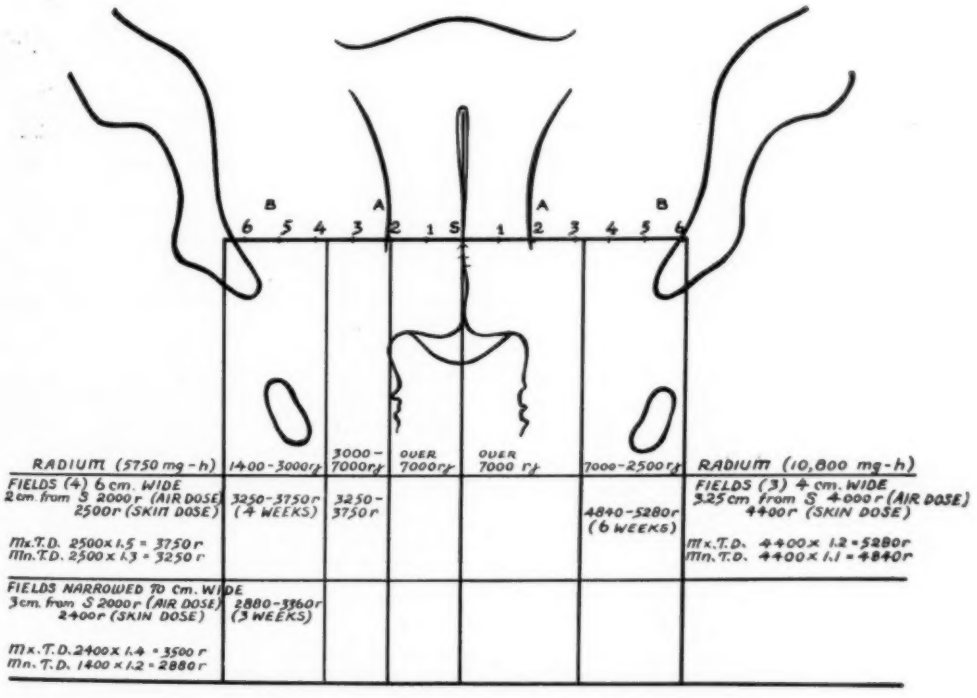
B
A
6 5 4 3 2 1 S 1 2 3 4 5 6
A
B
RADIUM (5750 mg-h)
1400-3000 rγ
3000-7000 rγ
OVER 7000 rγ
OVER 7000 rγ
7000-2500 rγ
RADIUM (10,800 mg-h)
FIELDS (4) 6 cm. WIDE
2 cm. from S 2000 r (AIR DOSE)
2500 r (SKIN DOSE)
3250-3750 r (4 WEEKS)
3250-3750 r
4840-5280 r (6 WEEKS)
FIELDS (3) 4 cm. WIDE
3.25 cm. from S 4000 r (AIR DOSE)
4400 r (SKIN DOSE)
Mx. T.D. 2500 x 1.5 = 3750 r
Mn. T.D. 2500 x 1.3 = 3250 r
Mx. T.D. 4400 x 1.2 = 5280 r
Mn. T.D. 4400 x 1.1 = 4840 r
FIELDS NARROWED TO 3 cm. WIDE
3 cm. from S 2000 r (AIR DOSE)
2400 r (SKIN DOSE)
2880-3360 r (3 WEEKS)
Mx. T.D. 2400 x 1.4 = 3500 r
Mn. T.D. 1400 x 1.2 = 2880 r

Fig. 10. Examples of planning with different dosage (mg. hr.) of radium.

On the right 5,750 mg. hr. have been delivered, contributing 1,400 r_γ to the pelvic wall. The anteroposterior diameter of the patient is 21 cm., and four parametrial portals (anterior, sacral, gluteal, and sciatic) are used. These portals are narrowed during the course of treatment. The maximum tumor dose (Mx. T. D.) to the pelvic wall from the x-rays is 7,000 r and the minimum tumor dose (Mn. T. D.) is 6,100 r in seven weeks.

On the left 10,800 mg. hr. have been delivered, contributing 2,500 r_γ to the pelvic wall. The anteroposterior diameter is 18 cm., and only three parametrial portals (anterior, sacral, and gluteal) are used, 4 cm. wide from the beginning. The maximum tumor dose from the x-rays is 5,200 r and the minimum tumor dose is 4,840 r in six weeks.

Some clinical observations have indicated that in the treatment of metastatic nodes longer fractionations may be beneficial because, due to the tumor bed, one has to rely primarily on the direct action of radiation.

The correspondence of the percentage of failures in each stage of the disease, with the percentage of microscopic lymph node involvement found in surgical specimens, suggests the possibility that the controlled cases represent the ones without lymph node involvement.

DISCUSSION

The doses given with the technic described above are higher than those given before. The complications to be expected are local necrosis and marked fibrosis of the vagina, bowel and bladder complications, and vascular connective-tissue reactions. If the fields are as widely separated as they should be, the local reaction on the cervix and the vagina, the bladder and rectal reactions should not be any more than those coming from the radium treatment. Our experience with the cases treated so far have substantiated this theoretical consideration, based on physics, and we have observed only occasional mild diarrhea and cystitis due to the external irradiation. In all other instances the diarrhea and cystitis appeared during and immediately after the radium therapy and subsided while the external irradiation was carried on. In only one instance (out of 42 cases) has it been necessary to discontinue the x-ray treatment. One can say that in cases treated so far, incidence of complications during and after treatment has been very low. This justifies carrying on this method of treatment. However, it must be kept in mind that some of the late complications, which may appear up to several years after completion of treatment, may develop. Among those which might be expected are the complications due to damage of the vessels along the pelvic wall.

This technic represents an attempt to give higher dosage to the lateral aspects of the parametrium and pelvic nodes, without any claim that many metastatic nodes will be cured, despite the higher dosage level. Lymphadenectomies, after irradiation, will show if one has diminished the incidence of involved nodes, and follow-up will determine if there is any increase in the cure rate of the more advanced stages.

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REFERENCES

1. ARNESON, A. N., AND QUIMBY, E. H.: Distribution of Roentgen Radiation Within the Average Female Pelvis for Different Physical Factors of Irradiation. Radiology **25:** 182–197, 1935.

2. BUSCHKE, F., AND CANTRIL, S. T.: Irradiation Failures in Early Cervical Cancer. Improved Irradiation or Return to Surgery. Am. J. Roentgenol. **54:** 60–71, 1945.

3. CORSCADEN, J. A., GUSBERG, S. B., AND DONLAN, CHARLOTTE P.: Precision Dosage in Interstitial Irradiation of Cancer of the Cervix Uteri. Am. J. Roentgenol. **60:** 522–534, 1948.

4. HEYMAN J.: Improvement of Results in Treatment of Uterine Cancer. J. A. M. A. **135:** 412–416, 1947.

5. JOLLES, B., AND MITCHELL, R. G.: Optimal Skin Tolerance Dose Levels. Brit. J. Radiol., **20:** 405–409, 1947.

6. LEDERMAN, M., AND LAMERTON, L. F.: Dosage Estimation and Distribution in the Radium Treatment of Carcinoma of the Cervix Uteri. Brit. J. Radiol. **21:** 11–26, 1948.

7. MAYNEORD, W. V.: Energy Absorption. Brit. J. Radiol. **13:** 235–247, 1940.

8. MCGREGOR, L.: Reactions to Radiation in Lymph Nodes Containing Carcinoma Metastases of the Squamous Cell Type. Acta radiol. **15:** 129–152, 1934.

9. MEREDITH, W. J., editor: Radium Dosage: The Manchester System. Compiled from articles by Ralston Paterson and others. Baltimore, Williams & Wilkins Co., 1948.

10. MORTON, D. G.: Surgical Treatment of Cervical Cancer. Wertheim Operation; Pelvic Lymphadenectomy. Am. J. Roentgenol. **57:** 685–690, 1947.

11. PATERSON, R.: The Treatment of Malignant Disease by Radium and X-rays. Baltimore, Md., Williams & Wilkins Co., 1948.

12. RICHARDS, G. E.: Analysis of Technical Factors and Results of Treatment in Carcinoma of the Cervix Uteri. Am. J. Roentgenol. **58:** 783–796, 1947.

13. SANDLER, B.: Preliminary Note on the Planning of Combined Radiotherapy of Carcinoma of the Cervix Uteri. Brit. J. Radiol. **16:** 331–337, 1943.

14. SILVERSTONE, S., BRAESTRUP, C. B., AND WOLF, B. S.: Isodose Charts for Fields of Special Usefulness in the Treatment of Cancer of the Uterine Cervix. Am. J. Roentgenol. **49:** 819–821, 1943.

15. TWOMBLY, G. H., AND CHAMBERLIN, J. A.: Intravaginal Roentgen Therapy in Cancer of the Cervix Uteri. Radiology **52:** 14–25, 1949.

16. WATERMAN, G. W., AND REID, W. A.: Place of Deep External X-ray Irradiation in the Treatment of Carcinoma of the Cervix by Long Element Needles. Radiology **52:** 34–40, 1949.

17. WINTERNITZ, J. G.: Carcinoma of the Cervix: Value and Techniques of Supplementary X-Ray Therapy. Brit. J. Radiol. **21:** 27–40, 1948.

18. WOOD, C. A. P.: Factors Influencing Response of Cancer to Radiation. J. A. M. A. **140:** 513–518, 1949.

QUESTIONS AND ANSWERS

Chairman Arneson: An opportunity will now be given the discussants to answer the questions which have been submitted. Dr. Galvin, would you care to answer your questions, please?

Dr. Galvin: I am asked two questions.

Question: Does there exist a relationship between leukoplakia and intra-epithelial carcinoma of the cervix?

The possible association between the clinical entity of leukoplakia and the histologic entity of intra-epithelial carcinoma of the cervix attracted a great deal of studious investigation during the earlier part of the century. In Germany, Hinselman and Schiller felt that such a relationship existed; however, their findings were never too convincing and subsequent investigations have failed to corroborate them. At the present time, pathologists do not regard leukoplakia of the cervix as a precancerous condition, although there is good evidence that leukoplakia of the vulva may be a precursor of vulvar carcinoma.

Question: Please comment on the advisability of amputating the cervix on the basis of a positive cytological smear, as this may also be therapeutic, if intra-epithelial carcinoma is present.

This query merits several comments. To begin, taking our cue from Papanicolaou, we feel that no therapy should ever be instituted on the indication of positive cytological smears alone, but that the histologic evidence of a biopsy specimen should be present before any treatment is undertaken. Too, amputation of the cervix as a confirmatory diagnostic method seems a bit radical, since such evidence can be obtained by simple sharp conization of the mucocutaneous junction of the cervix. We have utilized this device many times to confirm a suspicion aroused by biopsies and have found it most satisfying. Then, although Norman Miller at the University of Michigan practises cervical amputation as a treatment for intra-epithelial carcinoma, we are inclined to believe that this procedure may be inadequate, as the removed uterus in many of our cases of intra-epithelial carcinoma has shown carcinomatous tissue high in the cervical canal above the usual point of amputation.

Chairman Arneson: Thanks, Dr. Galvin. Dr. Henriksen, you have a big sheaf of questions.

Dr. Henriksen: The first question deserves comment.

Question: Apart from the advances in anesthesia, antibiotics, and shock therapy, is there reason to believe that present surgical technic is better than that of Clark, Bonney, and Wertheim? Subtracting operative mortality, their best results in operable cases was 34 per cent.

A careful study of the operative records of these men emphasizes their operative skill despite the absence of asepsis, antishock therapy, and dependable anesthesia. Bonney is a contemporary, so it may be permissible to insert John Sampson's name instead. I trust that my previous comments have not been interpreted as expressions of degradation, for our debt to those pioneers is fully appreciated by all of us.

Question: Does the age of the patient, even in Stage III, indicate need for a surgical procedure? Example, a 23 year-old patient, Stage III, Grade III: Surgery, or radiation, or both?

I do not do the so-called Brunschwig operation. In a few carefully selected cases I follow the technic of Meigs. I certainly would not tackle a Stage III, Grade III, unless my cytologic and biopsy studies revealed the case as resistant to radiotherapy. In these unfortunate cases, surgery is our only hope.

Question: Kindly elaborate on your findings of percentage of distant metastases, untreated and treated cases.

Distant metastases occurred in 37.8 per cent of the treated and 32.5 per cent of the non-treated cases. Statistically speaking, this relatively slight difference in such a small series of cases permits no conclusion. Some of the cases had multiple sites. One interesting case with a brain involvement was first seen on the neurological service. A pelvic examination was not done, and the correct diagnosis was made from a biopsy of skin tumor on the chest wall. The majority of the cases with liver metastases or bone metastases also had multiple sites of involvement. I do not have the figures of the individual case incidence. Of interest is one case nineteen years after irradiation, with an isolated pulmonary metastasis.

Question: Have you any evidence from the autopsy findings that radiotherapy can sterilize metastases in the pelvic lymph nodes?

This question is brought up every time the problem of cervical cancer is discussed. I cannot present the evidence necessary to settle the question one way or the other. If we could run a series of cases, removing a node at specified intervals, then we could possibly tell whether or not the radiation was affecting the tumor cells. We do find an occasional node with a very thick capsule and definite hyalinization and fibrosis. And within these altered nodes we do occasionally find small islands or nests of cells that we have interpreted as carcinoma cells. However, we have no means at our disposal to tell whether or not these cells are dead or alive. It is my impression that some of them, even after so-called adequate radiation therapy, do possess the power of a resurgence of vitality, and, at a later date, recover sufficiently to continue active growth. We

also find nodes, in patients who have been "adequately irradiated," with microscopic evidence of the degeneration associated with the effects of radiation. However, similar changes within the nodes are also found in individuals who have not been treated. Originally, when I started this study in 1931, we felt—and the old adage holds true, that the less one knows the more one can talk—that we could readily separate the treated nodes from the non-treated nodes. At the present time, we are unable to do this in a dependable manner.

Question: There is a wide disagreement as to the effectiveness of radiation on carcinoma with metastasis to the regional nodes. Do you have an opinion on this?

This is an extremely dangerous question to answer before a group of radiologists. I am a simon-pure gynecologist and accepted this assignment with the promise that adequate protection would be given to me when such questions were forthcoming. I feel that when the nodes of the common iliac and the hypogastric area are included, the answer is that these nodes are not sterilized. Certainly the nodes of the secondary group escape the effects of the radiotherapy. Thus our only course of treatment would be surgical. I do not think that the Brunschwig operation is indicated except as a palliative measure for those patients with extensive involvement in the lower pelvis, resulting in pressure on the ureters with subsequent uremia. I do not think that I am enough of an authority to answer the question.

Question: What is the incidence of free parametria in the presence of positive lymph nodes?

There is a wide variation of opinion on this question, though most observers do admit the presence of a free parametrium. The highest incidence is recorded in the reports where the examination was by manual palpation or possibly by one section. In a carefully studied series of 56 cases in which we did an average of 5 blocks of each parametrium, we found the incidence of free parametria to be approximately 5 per cent in the non-treated cases with positive lymph nodes. Approximately thirty-five years ago, Sampson, after careful study of the parametria, concluded that the question could be answered only by doing serial sections. In his comments on the studies of Wertheim, he stated that each case thus studied would require a minimum of 35,000 slides. Such a study is beyond the facilities at my disposal. However, I do think that the incidence of free parametria in the presence of positive lymph nodes is uncommon.

Chairman Arneson: Thanks, Dr. Henriksen. Dr. Nolan, would you be good enough to answer your questions, please?

Dr. Nolan: My first question concerns the recommended treatment in carcinoma *in situ*. Dr. Galvin, I believe, has answered this quite adequately.

Question: Is there any advantage of combined surgery and irradiation?

We will assume this question to mean a radical hysterectomy after complete radiation therapy. In my experience, this is a deleterious procedure. When one subjects a patient to extensive radiation therapy and then tries to add to this an extensive operation, the incidence of complications is quite high; some 20 per cent in my own experience. As a rule, these complications are of serious nature. In one case in which there was no evidence of residual cancer, a fistula developed and the patient nearly killed herself because of the fistula. I think others have had similar experience. I believe that Morton tried this method of treatment but found his complications to be too high; so, instead of using complete radiation, he used just a little radiation and a lot of operation. Most people who have done this have given either just a little bit of operation and a lot of radiation, or *vice versa*.

Heyman, some years ago, studied his patients with cancer of the cervix and supposed that if he had done a simple complete hysterectomy after completion of the irradiation, he would have prevented recurrences in 11 patients. If he had applied this operation, then, to all patients, he might have had an operative mortality in some 16 patients. So, in all probability, it is not a good idea.

Question: What is the approximate incidence of intestinal complications of radiation treatment of cancer of the cervix?

That, again, depends on the type of material one has; how advanced the lesion is; how many infected cases, etc. In general, something like 10 per cent of patients may have diarrhea, but in very few is this severe. What is the incidence of factitial proctitis in Dr. Garcia's series? One per cent? That is with good radiation therapy, but it is very seldom that the intestinal complications demand anything radical in the form of treatment. Usually the patients can be carried through on conservative medical treatment. Dr. Arneson routinely prescribes cod-liver oil instillations in the rectum after radium treatment, and starch enemata, in order to cut down the severity of any proctitis that might develop. Actually, the patients that come to a colostomy are few.

Chairman Arneson: Thank you, Dr. Nolan. Dr. Fletcher, will you answer your questions?

Dr. Fletcher: I have two questions:

Question: Do you treat all fields every day?

No, we treat two fields a day, right and left. One day we treat the anterior portals, another day the sacral, another day the gluteal, etc.—five days a week, that is to say, every field is treated on a little less than an average of twice a week.

The over-all time of treatment for the x-ray therapy runs from four to six weeks, depending upon the total dose and also depending upon the bladder and rectal reactions following radium implantation. If there is even a mild diarrhea and cystitis, the x-ray therapy is either delayed for a few days or the daily dosage is lower until the symptoms have reasonably subsided.

Question: Can the technic be applied to all patients without an excessive expenditure of time?

There is no doubt that the work-up of the volume distribution requires quite a few man hours on the light table, working with the isodose curves. In well organized radiotherapy and radiophysics departments, residents can do some of it and there should be technicians trained to calculate volume distributions. For all practical purposes, when one has calculated a certain number, let us say 15 or 20, most cases can be fitted into one of these patterns with very little inaccuracy. All that is needed is the measure of the degree of compression and the drawing of the various fields in their exact geometrical relationship. Then one goes over the collection to see which volume distribution is closest to the case under consideration. This does not require much time.

DISCUSSION

J. del Regato M.D. (Colorado Springs): We agree with Doctor Galvin that the superficially spreading carcinomas, or carcinomas *in situ*, should be specially designated for purposes of study; we know that errors may be committed, both by excess and by defect, in the histopathologic diagnosis of these lesions. Surgeons and pathologists have preferred to treat such carcinomas surgically in order to study the entire specimen; this is understandable. We have treated some cases by transvaginal roentgen therapy, which may assure their permanent control as well as any other method without untoward irradiation of the ovaries. This mode of treatment requires, however, some certainty that the tumor has not already become infiltrating at some point at the endocervix: a dilatation and curettage should be done before treatment to ascertain such possibility.

It would be of great interest to know the exact proportion of distant metastases found in the different stages of carcinoma of the cervix, if it were possible to ascertain this at the time that the patients are first examined or when treatment is instituted. This, of course, cannot be done, and when the disease fails to be controlled by treatment and a generalized incurable state eventually develops, the cases all belong in the same category; a division of these autopsied cases according to the staging that was done before treatment is unlikely to yield any fruitful information. Doctor Henriksen pointed out the possibility of histopathologic error in referring to the clinical classifications of the carcinomas of the cervix in four stages. It is true that what is thought to be a Stage III or IV lesion may actually be a relatively small carcinoma associated with post-inflammation fibrosis, secondary infection, edema, etc., but the fact is also true that a cancer considered as a Stage I may already have distant metastasis. In spite of these possible errors, the League of Nations classification of carcinoma of the cervix remains the only example of useful clinical staging in the field of cancer, for purposes of prognosis. Comparisons of results of different treatments should be possible, providing the staging is done before treatment and that it is not changed by subsequent findings, such as information obtained on the operating table.

Doctor Nolan's presentation is commensurate with his previous didactic efforts in the field of radium therapy. It is perhaps only fair to state that any points chosen in a frontal plane of the pelvis for purposes of theoretic analysis are meaningful within the limits of that plane and the circumstances of the analysis. Indeed, with the use of radium therapy alone, the difficulty consists in the over-irradiation of medial tissues while peripheral areas of the tumor may not receive sufficient radiation.

Doctor Fletcher deserves to be congratulated for his efforts in a field that requires great emphasis, that of the external pelvic roentgen therapy. It is the external irradiation which is responsible for the control of the majority of cases of carcinoma of the cervix that are being cured. It is in the perfecting of the technics of external irradiation that the greater possibility of improvement of our results lies. While radium treatment is being practised at a maximum of dosage and with a sufficiently high degree of skill, the external irradiation is usually administered routinely without adaptation to the circumstances of the case and with dosages usually far below the limits of adequacy or tolerance. I do not think that compression or that the shape of the applicators is as important as Doctor Fletcher believes, but I am certain that his efforts are well directed, for methodic external pelvic roentgen therapy is paramount to the successful treatment of these patients.

Dr. Henriksen (*closing*): I would like to add one point. As one studies cancer, especially of the cervix, one conclusion is outstanding, and that is the state of confusion, not only of the diagnosis, but also in the field of therapy. In bringing this session to an end, may I offer the old proverb of the six learned blind Hindus, who, confronted

with an elephant, decided to study the animal individually. After each had carefully examined his small part of the animal, the six gathered to present their impressions. Thus we see one describing the animal as a snake, having examined the tail; another a wall, having examined the side; another a tree or pillar, having examined the leg. And so the proverb goes on; each argued loud and long, and each was partly in the right, and all were in the wrong.

SUMARIO

Certamen Relativo al Cáncer del Cuello Uterino

Bajo la presidencia del Dr. A. N. Arneson, llevóse a cabo un certamen relativo al cáncer del cuello uterino, en la reunión anual de la Sociedad Radiológica de Norte América, teniendo por objeto, según lo expresara el presidente, presentar ordenadamente los problemas suscitados por el diagnóstico más frecuente del cáncer en su etapa preinvasora e intentar un análisis crítico de las medidas terapéuticas en relación con los requisitos que hay que llenar en el tratamiento adecuado de la lesión local así como de las vías normales de difusión.

En el estado actual de nuestros conocimientos, la etapa intraepitelial es la más temprana en que cabe hacer el diagnóstico del cáncer cervicouterino y la que ofrece, pues, el mejor pronóstico. Galvin la definió como lesión de la superficie del cuello uterino en la que las células poseen todas las propiedades morfológicas y tintoriales de las malignas, pero careciendo todavía de la facultad invasora. Los datos tanto clínicos como histológicos apoyan la doctrina de que el carcinoma intraepitelial es el precursor del cáncer invasor del cuello uterino. El diagnóstico del mismo depende de que el clínico recuerde constantemente que todo cuello de aspecto anormal puede albergar un carcinoma latente, y de que el patólogo sospeche constantemente todo epitelio hiperactivo que encuentre en las biopsias cervicales.

La dispersión del carcinoma cervical fué discutida por Henriksen. La difusión a los ganglios linfáticos muestra un patrón bastante constante: en la mayor parte de los casos, aféctanse uno o más de los ganglios del grupo primario (paracervicales, ureterales, obturadores, hipogástricos e ilíacos externos) antes que los del grupo secundario (ilíacos primitivos, aórticos, sacros e inguinales). La propagación por difusión directa sigue los planos anatómicos: la invasión de la vejiga urinaria y los parametrios es frecuente; la invasión rectal suele demorarse hasta que el mal ha invadido la pared postvaginal. Los asientos más frecuentes de metástasis remotas en 356 casos autopsiados fueron el hígado, huesos, pulmones e intestino.

Las distintas clasificaciones propuestas de cuando en cuando para el carcinoma cervical fueron repasadas por Galvin, quien dedujo que la única base universal de clasificación es la difusión anatómica de la enfermedad. La clasificación de Schmitz no resulta del todo satisfactoria, pues agrupa todos los casos entre el período incipiente y el tardío en que la lesión ha avanzado más allá del estado de "pelvis congelada," lo cual comprende aproximadamente 60 por ciento de todos los casos observados. La clasificación de la Sociedad de las Naciones, que divide ese grupo intermedio en dos períodos, usando en particular como base de la división, el grado de invasión de los ligamentos anchos, se aproxima más al ideal. No obstante, se necesita otro grupo que comprenda puramente los casos tempranamente observables al microscopio, y que no resultan ni visibles ni palpables en el examen vaginal.

Aunque reconociendo que la radioterapia es en general el procedimiento de elección en el carcinoma del cuello uterino, Henriksen señaló que en algunos casos obtendrá mejores resultados la cirugía. Para los casos del Período 0, del llamado carcinoma *in situ*, adhiérese al procedimiento recomendado por TeLinde, a saber, panhisterectomía radical, sin extirpación obligada de los ovarios. En casos cuidadosamente

seleccionados de los Períodos I y II, Meigs ha usado la panhisterectomía radical con excisión de los ganglios linfáticos regionales. La operación es formidable, y el A. la limitaría a los casos reconocidamente radiorresistentes. La exenteración mutiladora de Brunschwig es mencionada como medio de aminorar los efectos de la extensión intrapelviana de la dolencia, aunque está aun por determinar si se halla justificada una intervención de tal magnitud.

La curieterapia fué discutida por Costolow, Nolan y DuSault, quienes repasaron sus limitaciones, tanto físicas como fisiológicas, compararon las técnicas fundamentales y presentaron los resultados de su método normalizado, analizándolos a base de distribución de la dosis. El tratamiento completo abarca de cuatro a seis semanas y comprende irradiación roentgen externa y radio por vía intracavitaria. La dosis de rayos X es 1,800 r (al aire) a cada una de cuatro puertas pelvianas, de 10 × 14 cm. (factores: 450 kv., filtración por 1.0 mm. de plomo, 50 cm. de distancia foco-piel, capa de hemirreducción de 5.0 mm. de cobre), administrándose diariamente a dos puertas 150 r (al aire). La dosis eritemática límite así obtenida representa 800 r. La irradiación intracavitaria se administra con un tándem intrauterino (2,600 mg.-hr. de exposición) y una bomba intravaginal (2,600 mg.-hr. de exposición). Se suministran dos o tres tratamientos a plazos de dos o tres semanas. La dosis eritemática límite representa 1,000 roentgens gammas. Los coeficientes de sobrevivencias de cinco años en una serie de 500 casos de los AA. son: Período I, 73 por ciento; Período II, 50 por ciento; Período III, 38 por ciento; y Período IV, 0. A base de dosificación en D. E. L. (dosis eritemática límite), obtuviéronse los mejores resultados cuando la dosis llevada a un punto 2.0 cm. al lado de la línea media al nivel del orificio interno quedaba dentro de un límite de 7 a 11 D. E. L.

La roentgenoterapia como complemento del radio fué considerada por Fletcher. El objetivo de la irradiación externa es complementar la dosis de irradiación más allá de la zona en la que el radio solo resulta adecuado. Las zonas por tratar así son las caras laterales de los ligamentos anchos y sacrouterinos y los cuatro principales grupos ganglionares a lo largo del trayecto de propagación linfática por la pared pelviana. Hay que comprender también los ganglios presacros, que se hallan más alejados, si bien parece dudoso que pueda tratárseles debidamente con ninguna técnica. A fin de obtener una dosis de mayor profundidad, utilízanse campos pequeños: anteriores, perineos, glúteos y sacros, y conos de compresión. Los factores son: 400 kv., filtro de Thoraeus (equivalente a 3.0 mm. de cobre), capa de hemirreducción de 4.4 mm. de cobre, distancia foco-piel (con conos de compresión), 66.0 cm. Pueden administrarse a diario a dos puertas dosis de 300 r (al aire) a puertas de 6.0 cm. de ancho (en las enfermas delgadas) a 400 r por puertas de 4 a 5 cm. de ancho (en las enfermas con diámetros anteroposteriores por lo menos de 18 cm.). El objetivo consiste en entregar a la zona ganglionar una dosis tumor mínima de 5,000 r y a lo menos 6,000 r a un punto en la pared muscular de la pelvis a 5 cm. de la línea media, en el que radica el ganglio obturador. Esta dosis se administra en un período de seis a ocho semanas de tiempo.

Angiocardiography in Congenital Heart Disease of Cyanotic Type[1]

II. Observations on Tricuspid Stenosis or Atresia with Hypoplasia of the Right Ventricle[2]

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Baltimore, M.D.

IN THE FIRST OF this series of articles (6), we discussed the angiocardiographic changes in the tetralogy of Fallot and in "pseudo-truncus arteriosus." In this communication we shall direct our attention to another congenital cardiac disorder of the cyanotic type, namely, tricuspid stenosis or atresia with hypoplasia of the right ventricle. Until a short time ago, this anomaly was thought rather rare. Gibson and Clifton (8) discovered it only twice in 105 autopsies of children with congenital heart disease. Manhoff and Howe (9), in their recent review of the literature, however, found 33 instances of the condition; they added a case of their own, which was accompanied by transposition of the great vessels, atresia of the pulmonary artery, and a patent ductus arteriosus. Since this review, seven other cases have been reported, by Alexander and White (1), Taussig (14), Robinson and Howard (11), and Dunsky (7).

Tricuspid stenosis or atresia with hypoplasia of the right ventricle has recently stimulated considerable interest among cardiac surgeons. It has been found that in many patients with this anomaly the operative procedures used in the treatment of congenital pulmonic stenosis (2, 10) are beneficial. The functional improvement that is obtained by such surgical intervention appears to be greatest when there is a well established interauricular septal defect. Furthermore, surgery has been most effectively carried out when an exact knowledge of the anatomy of the cardiac structures and great vessels was established before the operation. It is therefore important that the diagnostic procedures used in the evaluation of these cases be directed toward a precise determination of the existing anatomical and physiological relationships if operative correction is planned.

ABNORMAL ANATOMY AND COURSE OF THE CIRCULATION

Tricuspid stenosis or atresia is always associated with a poorly functioning or non-functioning right ventricle. The hypoplastic ventricle seems to be the fundamental abnormality in this disorder, since it may occur without tricuspid stenosis or atresia as we have recently seen in two instances at autopsy. There is always an associated patent foramen ovale or interauricular septal defect, generally combined with other defects which provide a circulation compatible with life.

The narrowing of the tricuspid valve is variable. In the extreme, it may be represented by only a small nodule (Fig. 1) or depression in the floor of the right auricle. In such an instance the right ventricle may be so small that it is found only with difficulty at autopsy (Fig. 8). On the other hand, the tricuspid valve may have well developed leaflets even though the orifice is reduced in size (Fig. 2). In such instances, the right ventricle, although small, has a normal myocardium, and it may be assumed that it participates in the maintenance of the pulmonary circulation. In addition to the diminution in size of the right ventricle,

[1] The original title of this series of articles, "Angiocardiography in Congenital Heart Disease of Cyanotic Type with Pulmonic Stenosis or Atresia" (Radiology **52:** 329, 1949) has been altered to the present form since we have seen instances of hypoplastic right ventricle with tricuspid stenosis but without pulmonic stenosis.

[2] From the Department of Radiology and the Department of Surgery, the Johns Hopkins Hospital and University, Baltimore, Md. Accepted for publication in August 1949.

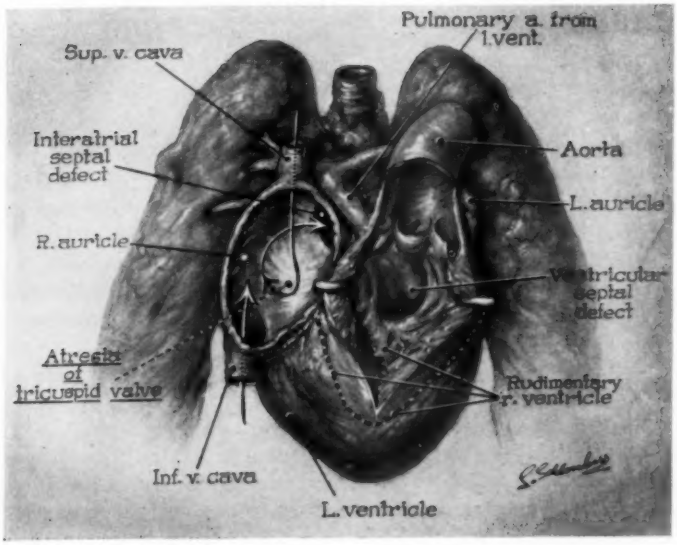

Fig. 1. Case 8: Tricuspid atresia with transposition of the great vessels. Drawing of autopsy specimen viewed from a right anterior position. The site of the tricuspid valve is represented only by a nodular area in the floor of the right auricle. The right ventricle was not visualized by angiocardiography.

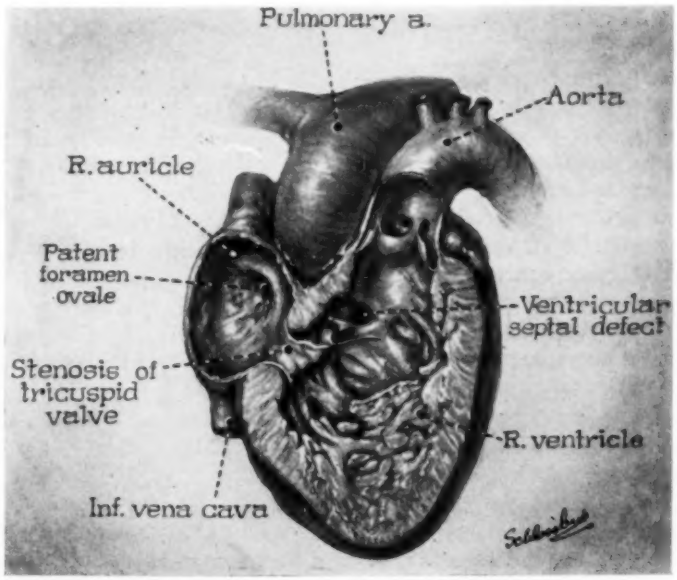

Fig. 2. Case 4: Tricuspid stenosis with transposition of the great vessels. The tricuspid valve was stenotic but allowed passage of some blood. The right ventricle, although small, undoubtedly aided in propulsion of blood through the aorta.

there is almost invariably some reduction in the size of the pulmonary orifice. Moreover, the pulmonary artery is frequently reduced in caliber and may be atretic.

The size of the interauricular septal defect is of considerable clinical significance. If there is atresia of the tricuspid valve, the entire volume of the systemic blood must pass through this defect. Taussig (14) has pointed out that if the defect is small, increased venous pressure and right auricular enlargement occur. Also, since the cardiac output is limited by the size of the defect, it is probable that patients with a poor interauricular communication will not be improved by the creation of an artificial ductus arteriosus.

The blood which flows through the interauricular septal defect may reach the lungs by any of three routes: (*a*) through a patent ductus arteriosus from the aorta; (*b*) through an interventricular septal defect which allows the blood to pass into the rudimentary right ventricle and out through the pulmonary artery; (*c*) through a transposed pulmonary artery which arises from the left ventricle. In most instances, there is a diminished flow of blood to the lungs.

Considerable enlargement of the left side of the heart is always present in tricuspid stenosis or atresia. The enlargement of the left auricle is understandable in view of this chamber receiving blood not only from the pulmonary veins but from the right auricle as well. Also, since the left ventricle must bear the burden of much of the pulmonary circulation as well as the systemic flow, hypertrophy of the myocardium and dilatation of its cavity are natural sequelae.

DIAGNOSTIC CONSIDERATIONS

Tricuspid stenosis or atresia with hypoplasia of the right ventricle has been familiar to cardiologists for some time, and certain criteria have been established (14) for its diagnosis. Fluoroscopic and radiographic examinations show an absence of the usual contours in the region of the pulmonary conus and a decrease in the usual convexity of the right contour of the heart. Left axis deviation in the electrocardiogram is also observed. Indeed, when such an electrocardiogram is obtained in the presence of congenital cyanotic heart disease, the diagnosis of tricuspid stenosis or atresia must be strongly considered. Occasionally, the usual roentgen and electrocardiographic evidence of stenosis and hypoplasia may be conflicting or may be obscured by associated anomalies. In these cases the diagnosis becomes difficult.

When surgical treatment is contemplated, a more exact knowledge of the pathological anatomy of the heart is required than can be provided by the usual clinical, radiographic, and electrocardiographic examinations. The size of the interauricular defect should be determined; if it is small, enlargement of the interauricular defect will constitute a more appropriate surgical treatment than the creation of an artificial ductus arteriosus. Also, in the presence of complete transposition of the great vessels without pulmonic stenosis, no benefit will be derived from the establishment of an artificial ductus arteriosus. (Some other type of operation would be necessary.) When pulmonic stenosis is present, an estimation of the size and position of the pulmonary arteries is helpful to the surgeon in planning his anastomotic procedures. Furthermore, the course of the aorta occasionally cannot be determined fluoroscopically and it must be demonstrated by some other method.

Previous experience with angiocardiography in the demonstration of numerous congenital anomalies of the heart (3–6, 12) appears to indicate that this technic may provide significant diagnostic information beyond that provided by conventional procedures in the patient whose primary lesion is tricuspid stenosis or atresia associated with hypoplasia of the right ventricle. During the past two years, we have had an opportunity to study several of these patients by angiocardiography.

MATERIAL

At this writing, angiocardiography has been performed at the Johns Hopkins

Hospital on 225 patients with congenital heart disease of the cyanotic type. Examinations were made in conjunction with other methods of study including fluoroscopy, conventional radiography, electrocardiography, and such physiological procedures[3] as venous catheterization of the heart. In this report we shall consider the angiocardiographic findings in 21 of these patients.[4] In each case, we believe that there was tricuspid stenosis or atresia associated with a hypoplastic right ventricle.

In 5 patients, the diagnosis was confirmed by autopsy. In 16 others, the angiocardiographic appearance was typical of tricuspid stenosis or atresia and the diagnosis was supported by such methods as electrocardiography and venous catheterization. Operation[5] was performed on 10 of these 16 patients and has been planned for 3 of the remainder. It must be emphasized, however, that at operation one can determine only the caliber and blood pressure of the pulmonary artery on the operative side, while the internal structure of the heart remains obscure. Hence the additional diagnostic information provided by surgery has been very limited.

Until a short time ago, we had not encountered an instance of right ventricular hypoplasia without narrowing of the tricuspid valve. Recently, however, we have seen two such patients at autopsy. In one there was no obvious reason for the right ventricular hypoplasia, whereas in the other it was associated with absence of the right coronary artery and an anomalous blood supply to the right ventricular myocardium. In both instances, angiocardiography gave evidence that the right ventricle was functioning poorly.

As we shall see presently, angiocardiography does not demonstrate tricuspid stenosis or atresia *per se* but merely indicates a malfunctioning right ventricle. We have therefore grouped the cases according to "visualization" or "non-visualization" of the right ventricle. In doing this, we wish to re-emphasize the fact that by angiocardiography one cannot differentiate between hypoplasia of the right ventricle with a relatively normal tricuspid valve and the much more common anomaly in which the hypoplastic right ventricle is associated with tricuspid stenosis or atresia. The functional result in the two is similar, *i.e.*, right ventricular malfunction.

In some instances the anatomy is further complicated by transposition of the great vessels. This additional abnormality gives rise to a fairly typical picture by angiocardiography so that the two groups of cases have been further subdivided as follows:

I. Visualization of the right ventricle.
   A. Without transposition of the great vessels.
   B. With transposition of the great vessels.
II. Non-visualization of the right ventricle.
   A. Without transposition of the great vessels.
   B. With transposition of the great vessels.

The following case reports present examples within each group and emphasize the characteristic angiocardiographic features.

GROUP I: VISUALIZATION OF THE RIGHT VENTRICLE

Seven of the 21 cases of tricuspid stenosis or atresia fall into Group I, in which the presence of contrast substance was clearly demonstrated in the right ventricle. Evidence of transposition of the great vessels was found in 2 instances, in both of which the diagnosis was confirmed by postmortem examination. We shall discuss first the 5 cases in which this additional anomaly was not demonstrated.

A. Visualization of the Right Ventricle Without Transposition of the Great Vessels

Four of these 5 patients underwent surgery, and 2 of the cases are reviewed in

[3] The physiological studies were conducted by Dr. Richard Bing and associates.

[4] Referred from the Cardiac Clinic of the Harriet Lane Home by Dr. Helen B. Taussig.

[5] Operations performed on the surgical service of Dr. Alfred Blalock.

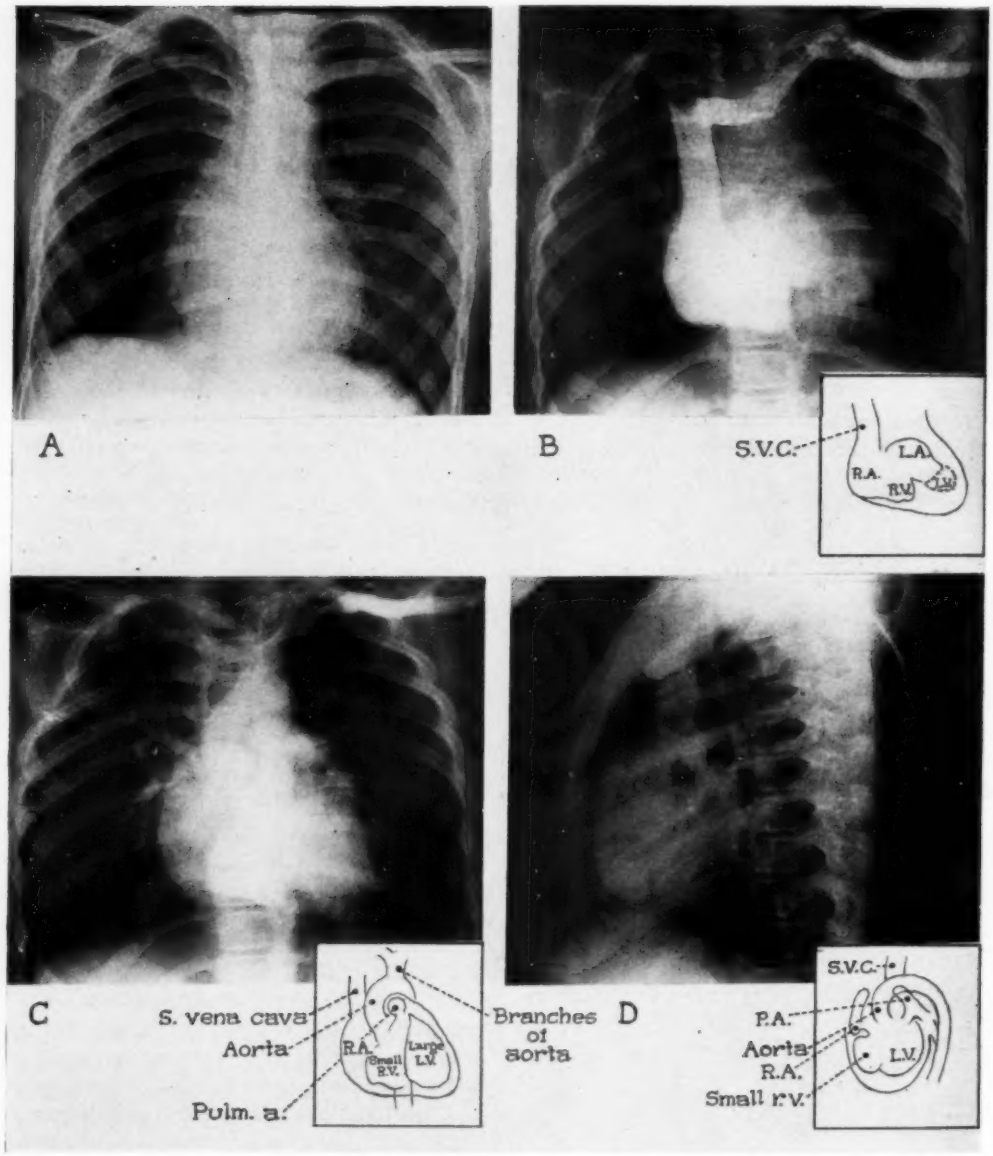

Fig 3. Case 1: Tricuspid atresia without transposition of the great vessels. A. Conventional roentgenogram. B. Angiocardiogram one second after injection, showing some contrast solution in all four chambers of the heart. C. Two seconds after injection both ventricles were well shown, as well as the aorta and pulmonary arteries. D. Lateral view three seconds after injection outlining the small right ventricle anteriorly. The pulmonary arteries and aorta were well demonstrated.

detail. No autopsies were performed in this group.

CASE 1: P. V., a 5 1/2-year-old white girl, had been cyanotic since birth. Her development had been retarded and she did not walk until the age of three years. Her exercise tolerance was variable but was limited. On physical examination, a rough, blowing systolic murmur was heard over the apex. There were severe cyanosis and clubbing of the fingers and toes. Fluoroscopy and conventional radiography (Fig. 3A) showed that the cardiac con-

tour was almost normal in appearance. The lateral contour of the right auricle was prominent and the left contour of the heart in the region of the pulmonary artery was concave. Electrocardiography showed left axis deviation and left ventricular preponderance. The clinical impression was tricuspid atresia with an interauricular septal defect.

Reproduction of a film (Fig. 3B) made one second after the injection was begun shows that the contrast solution entered the right auricle through a normally placed right superior vena cava. The right auricle was distended and contrast solution was already entering the region of the left auricle and left ventricle. At the end of two seconds, both ventricles were delineated (Fig. 3C). The left ventricular cavity was large, and although the exact phase of the cardiac cycle was uncertain, the ventricle appeared to be in partial diastole. A smaller right ventricle was clearly seen superimposed upon the spine. The pulmonary artery appeared promptly and was normal in size, but the branches in the lungs were poorly demonstrated. A lateral view (Fig. 3D) made three seconds after the initiation of the injection shows that almost the entire heart was opaque. Its anterior border was not prominent and did not reach the anterior portion of the chest. A diminutive right ventricle was faintly outlined in the lower anterior portion of the heart contour.

At operation, the right pulmonary artery was found to be normal in size but its pressure was very low. The right subclavian artery was anastomosed to the side of the right pulmonary artery. There was an immediate improvement in the patient's color and exercise tolerance, and this has been maintained for a period of ten months.

Comment: Although autopsy confirmation is lacking, there is good evidence that in this case there was a diminutive right ventricle which in turn caused a diminished flow of blood to the lungs. There was definite improvement following the creation of an artificial ductus arteriosus. The rapid passage of the contrast solution into the left side of the heart suggested that the interauricular defect was ample in size.

CASE 2: D. S., a 6-year-old white boy, was cyanotic at birth. At two weeks of age the diagnosis of congenital heart disease was made. The child's development was slow and on admission he was able to walk only three blocks at a slow pace. Physical examination showed clubbing of the fingers and toes and moderate cyanosis. A loud systolic murmur was audible over the entire precordium. The liver was not enlarged. Fluoroscopy and conventional radiography showed that the heart was normal in size, with a concave pulmonary artery segment. The pulmonary arteries could be readily seen but did not pulsate. Electrocardiography showed left axis deviation with left ventricular preponderance. The clinical impression was tricuspid stenosis or atresia.

Angiocardiograms are reproduced in Figure 4. One second after the injection of opaque medium was begun (Fig. 4A) the right auricle filled and there was reflux into the hepatic veins and inferior vena cava. Some of the contrast substance entered the left auricle and the size of the interauricular defect was demonstrated. One second later (Fig. 4B) the left ventricle and aorta contained a high concentration of the contrast substance. A rudimentary right ventricle also appeared in the usual location of this structure. The pulmonary arteries also contained a small amount of contrast material. A lateral film made one second after injection (Fig. 4C) showed the right auricle, the left auricle, and a small structure anteriorly, which was presumably the right ventricle. One second later (Fig. 4D) the aorta and the pulmonary artery were filled, as well as both ventricles. The pulmonary artery originated far anteriorly from the small right ventricle.

At operation, the pressure in the right pulmonary artery was low. The right subclavian artery was anastomosed to the side of the right pulmonary artery. There was immediate improvement in the patient's color and his activities were unrestricted when he was last seen one year after operation.

Comment: The interauricular defect was directly visualized and the rapid passage of contrast solution into the left side of the heart gave further evidence that the defect was adequate in size. There was only slight delay in filling of the pulmonary artery and it appeared likely that the right ventricle played some role in propelling blood through the pulmonary artery.

Summary of Findings in Group I-A: In all of the cases in this group the right ventricle was visualized, although it was quite small. The pulmonary arteries generally filled promptly and well. Delay in passage of contrast solution from the right to left auricle occurred in some instances; when this was encountered, a small interauricular septal defect was presumed to be present.

B. Visualization of the Right Ventricle with Transposition of the Great Vessels

The two infants whose cases are next reported presented puzzling problems in clinical diagnosis. In one, the presence of tricuspid stenosis or atresia was diagnosed,

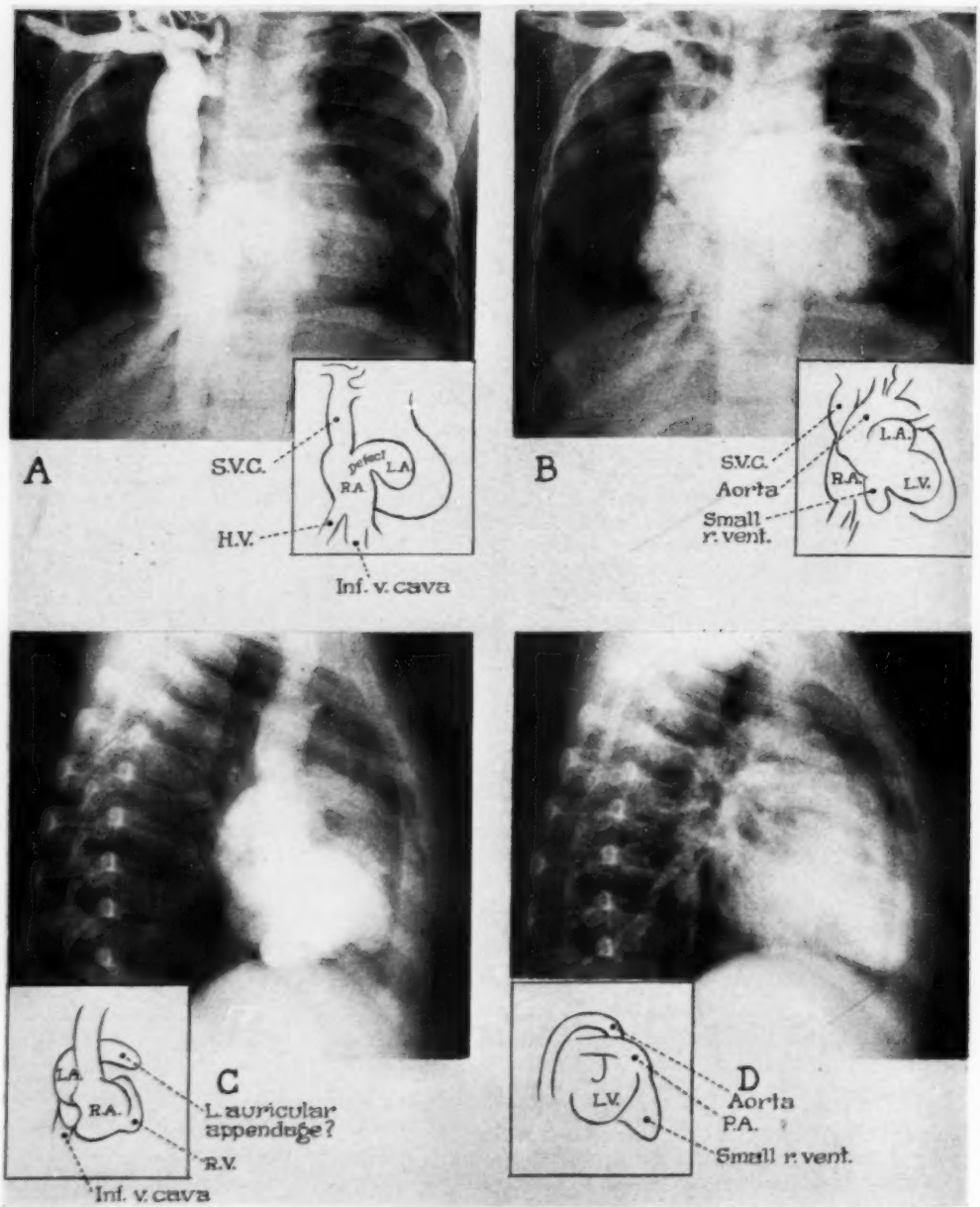

Fig 4. Case 2: Tricuspid stenosis or atresia without transposition of the great vessels. (See also Fig. 2). A. Angiocardiogram one second after injection showing both auricles well filled and demonstrating the interauricular septal defect. B. One second after "A" the contrast substance was present in all chambers of the heart. C. Lateral view one second after injection: small right ventricle poorly visualized. D. Lateral view one second after "C": origin of aorta and pulmonary artery demonstrated, as well as small right ventricle.

but the transposition was unsuspected even after angiocardiography. In the other, a clinical diagnosis of transposition was made, but the tricuspid atresia was not suggested until angiocardiography was performed. These experiences emphasize the

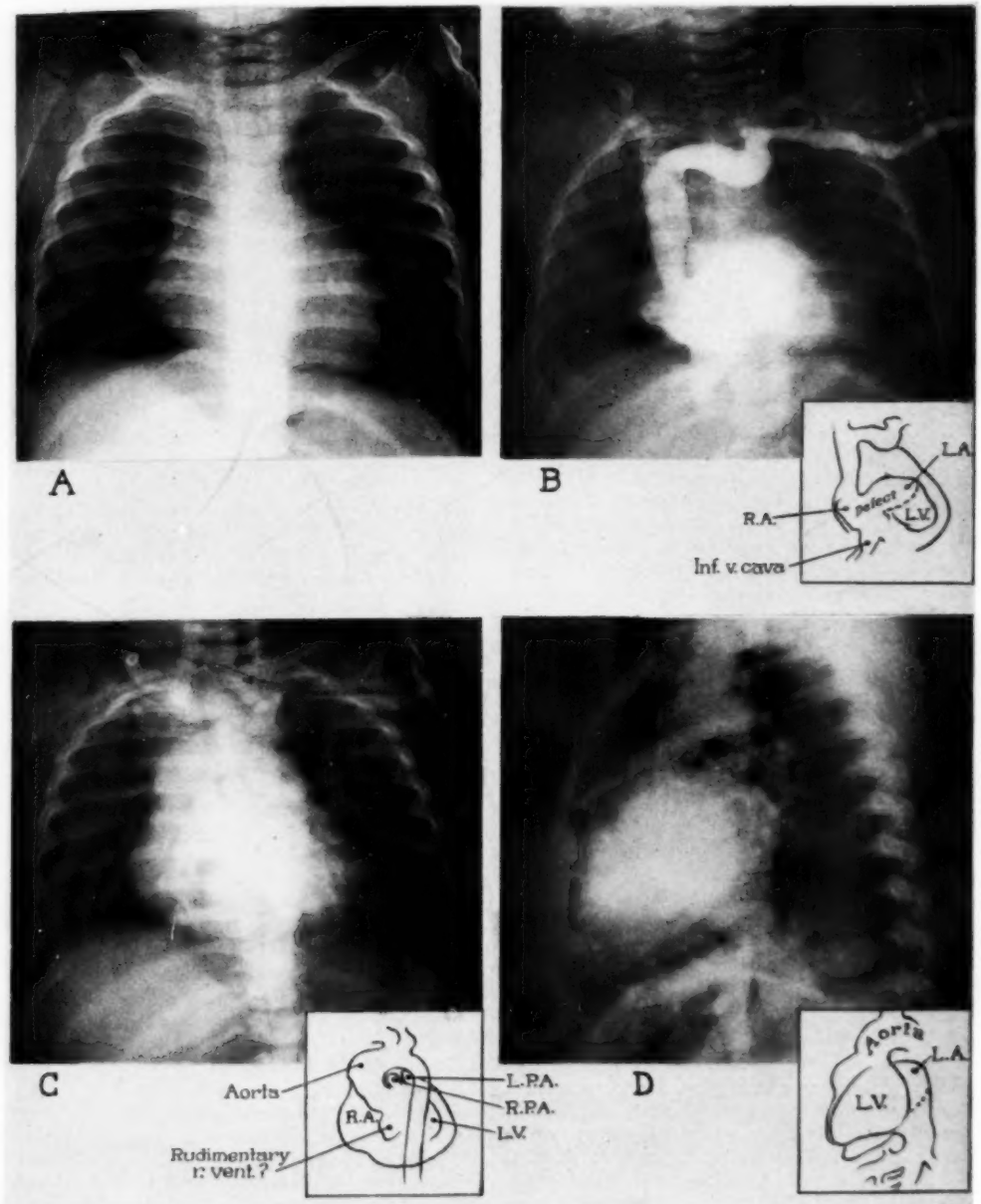

Fig. 5. Case 3: Tricuspid atresia with transposition of the great vessels. A. Conventional chest film. B. Angiocardiogram one second after injection, showing both auricles well filled and demonstrating the interauricular septal defect. C. One second after "B," the rudimentary right ventricle and the great vessels were well seen. The position of the aorta suggested transposition. D. Lateral view two seconds after injection. The right ventricle could not be seen.

difficulties of accurate diagnosis of congenital heart disease in infants.

CASE 3: P. K., a 20-month-old white boy, was cyanotic during the first week of life and did not learn to walk. For several months he had had attacks of extreme dyspnea and cyanosis. On physical examination, he showed severe cyanosis and

clubbing of the digits. There was no heart murmur. Fluoroscopy and conventional radiography (Fig. 5A) showed a heart of normal size with a contour that was not distinctly abnormal. There was an increased convexity in the region of the right auricle. Electrocardiography showed left axis deviation and left ventricular preponderance. The clinical diagnosis was tricuspid stenosis or atresia.

Reproduction of a film made one second after the beginning of the injection (Fig. 5B) shows a distended right auricle and some reflux of the contrast solution into the inferior vena cava. The left auricle was also filled, and the size of the septal defect between the two auricles was visualized. One second later (Fig. 5C) the left ventricle, the pulmonary arteries, and the aorta were filled with the contrast substance. The concentration of opaque medium was greater in the pulmonary arteries and the left ventricle than in the aorta. A faint shadow beside the left ventricle probably represented a rudimentary right ventricle. The aorta originated rather far toward the right side of the heart. At the end of two seconds (Fig. 5D) a lateral view showed almost the entire heart filled with contrast solution. The left auricle was partly outlined posteriorly in its usual position. The aorta contained contrast solution and several small branches of the pulmonary arteries were filled. The left ventricle was large enough to obscure the other structures of the heart. There was some clockwise rotation of the heart which tended to bring this ventricle into a more anterior position.

The angiocardiograms were interpreted as showing a hypoplastic right ventricle, with an interauricular septal defect of adequate size, and a large left ventricle. The aorta originated farther toward the right than in the preceding cases, but it was thought that this case in all other respects resembled those described under Group I-A.

At operation, the right pulmonary artery was seen to be small, with feeble pulsations. The proximal end of the divided right subclavian artery was anastomosed to the side of the right pulmonary artery. There was an immediate improvement in the patient's color and general condition. Subsequently his entire disposition was changed and he left the hospital much improved.

Improvement was maintained for several months, but death occurred approximately ten months later, from what cause we do not know. An autopsy, performed elsewhere, showed atresia of the tricuspid valve with a rudimentary right ventricle. The pulmonary artery originated entirely from the left ventricle. As the pulmonary valves were rudimentary, there was probably some degree of pulmonary valvular insufficiency. The aorta overrode the ventricular septum and presumably originated partly from the left ventricle and partly from the rudimentary right ventricle. The left ventricle was large. All of the pulmonary veins emptied into the right auricle.

Comment: Atresia of the tricuspid valve with rudimentary right ventricle was diagnosed correctly. We failed to appreciate that there was also a partial transposition of the great vessels. Reviewing this case in the light of the autopsy findings, we now realize that the aorta arose far toward the right side of the heart and the pulmonary arteries filled promptly and with a higher concentration of the contrast substance than did the aorta. The abnormal communication of the pulmonary veins with the right auricle was not suspected.

CASE 4: C. T. S., an 11-month-old male infant, had been cyanotic since birth and had suffered from frequent attacks of illness thought to be pneumonia. During the two months prior to admission he had experienced episodes of severe dyspnea. Physical examination revealed severe cyanosis and clubbing of the fingers and toes. The heart was enlarged and there was some deformity of the anterior chest. A systolic murmur was heard over the entire thorax, and a systolic thrill could be felt over the entire precordium.

Fluoroscopy and conventional radiography (Fig. 6A) showed enlargement of the heart both to the right and to the left. The base of the heart was seen to be narrow in both anteroposterior and oblique views. It was thought that there was enlargement of the right auricle, the right ventricle, and the left ventricle. There was considerable prominence of the pulmonary vascular markings. Electrocardiography showed peaked P waves and a deep S wave in the three standard leads, so that the axis deviation could not be determined. In the unipolar precordial leads there was evidence of hypertrophy of both ventricles with the right being larger. The clinical impression was transposition of the great vessels.

Reproduction of a film made two seconds after the start of injection (Fig. 6B) shows that the contrast solution entered the right auricle and a small amount was immediately expelled through the aorta. Since the left side of the heart was not definitely opaque, it is possible that the aorta filled from the right ventricle. The distribution of the contrast substance into irregular streaked areas was confusing. One second later (Fig. 6C) the left auricle filled in high concentration and there was a faint opacity due to contrast substance in the left side of the heart and the right pulmonary artery. The heart was rotated in a counter-clockwise direction, so that the left auricle was further toward the right side of the heart than usual. Reproduction of a film (Fig. 6D) made at the end of two seconds in the lateral projection shows that the general region of the left auricle and left ventricle filled as well as the aorta. The aorta originated far anteriorly and appeared to be in com-

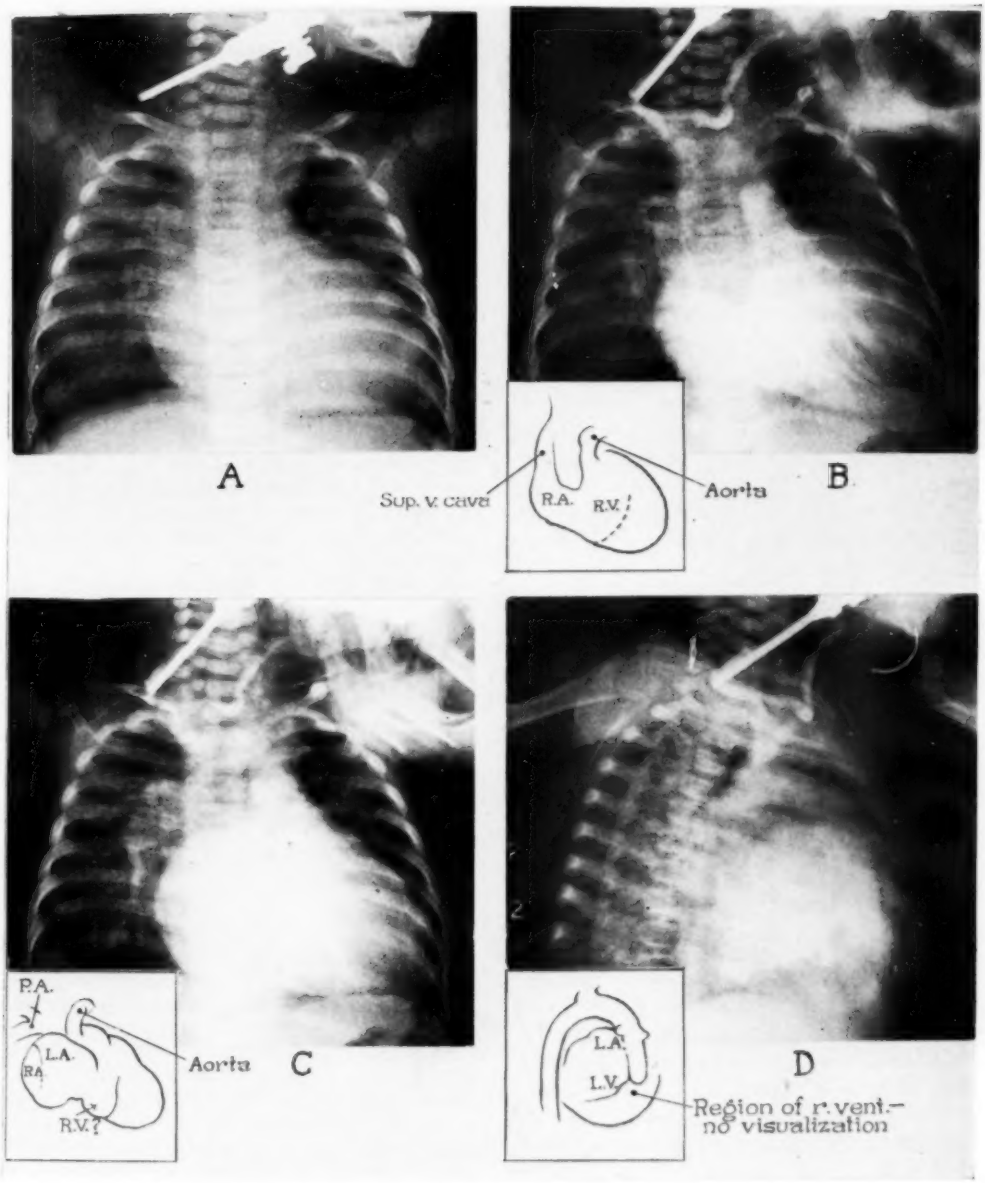

Fig. 6. Case 4: Tricuspid stenosis with transposition of the great vessels. A. Conventional roentgenogram showing heart enlarged to right and to left. B. Angiocardiogram two seconds after injection. C. One second after "B." D. Lateral view two seconds after injection. The aorta originated anteriorly and the right ventricular area did not opacify.

munication with the right ventricle. The region of the right ventricle was not filled, and a roentgenogram made one second later showed essentially the same contour. The pulmonary artery was not distinctly seen. The angiocardiographic findings were interpreted as showing a transposition of the great vessels with a tricuspid stenosis and a hypoplastic right ventricle.

At operation, the right pulmonary artery was found to be large, with no elevation in internal pres-

sure. The right pulmonary vein was anastomosed to the right auricle. The patient died on the second postoperative day.

At autopsy, the orifice of the tricuspid valve was small (Fig. 2), and the right ventricle was about one-half the size of the left ventricle. A moderate-sized interventricular septal defect was present, and the aorta may have filled in part through this defect. The pulmonary artery was much larger than the aorta, and a patent foramen ovale of moderate size was observed.

Comment: In the anteroposterior view, the right ventricle appeared to fill, but in the lateral view it was not identified. This may have been due to the right ventricle being in systole and therefore invisible in the latter instance. On the other hand, the discrepancy may be better explained by the difference in the volume of the shunt from the right to the left auricle during the two injections. Such a difference could be caused by differences in the rapidity with which the contrast substance was injected into the heart, and differences in the direction of the shunt at the time of the injection. This may have produced the dissimilar appearance in the two sets of films and is one of the variable factors encountered in the procedure.

Angiocardiography confirmed the clinical impression that there was transposition of the great vessels. It further led us to suggest that there was stenosis of the tricuspid valve with a hypoplastic right ventricle which had not been previously suspected.

Summary of Findings in Group I-B: In these cases the aorta was seen to originate far to the right in the anteroposterior view and to lie anteriorly in the lateral view. The right ventricle was small and was not seen even in the lateral projection. This complex abnormality is rare and in our cases was associated with marked disability.

GROUP II: NON-VISUALIZATION OF THE RIGHT VENTRICLE

Fourteen of the 21 cases fall into Group II, in which the right ventricle was not visualized. Four of the 14 patients had transposition of the great vessels associated with the tricuspid lesion, whereas the tricuspid stenosis or atresia with hypoplastic right ventricle was the salient abnormality in the remaining ten. We shall discuss the latter group first.

A. Non-Visualization of the Right Ventricle Without Transposition of the Great Vessels

This group of 10 patients includes 7 who were operated on; one of these came to autopsy. For the remaining 3 patients there is no pathological proof of the diagnosis, but the clinical and angiocardiographic studies seemed fairly conclusive. Three detailed case reports follow:

CASE 5: H. G., a 25-year-old white woman, had been cyanotic since the first week of life. Despite this, she had been fairly active until two years before admission, when her exercise tolerance became more limited. Recently she had noted edema of the feet and ankles. Physical examination showed pronounced cyanosis, and there was clubbing of the fingers and toes. A faint, short systolic murmur was audible over the precordium. The heart was enlarged to percussion and the liver was 4 cm. below the costal margin.

Fluoroscopy and conventional radiography (Fig. 7A) demonstrated considerable cardiac enlargement and some concavity in the region of the pulmonary artery. The aortic knob was prominent and pulsated. The hilar shadows were small, with numerous fine markings radiating into both lung fields. In the oblique views both ventricles were thought to be enlarged and the pulmonary window was hazy. Standard electrocardiographic leads indicated the presence of left axis deviation, but precordial leads showed what was interpreted as right ventricular hypertrophy.

Angiocardiography was not entirely satisfactory, this being one of the first patients in our series. Reproduction of a film made one second after injection shows that the contrast solution entered the right auricle through a normally placed superior vena cava (Fig. 7B); the auricle was incompletely outlined. At the end of four seconds, a large ventricular cavity filled with a high concentration of the contrast substance (Fig. 7C). There was some regurgitation into the inferior vena cava. At the end of five seconds, a faint concentration of contrast material was present in the aorta (Fig. 7D). This is poorly shown in the reproduction. The pulmonary arteries were not visualized. The slow clearing of the contrast medium from the heart is compatible with some degree of myocardial insufficiency. The angiocardiograms were originally interpreted as suggesting a large single ventricle with pulmonic stenosis or atresia.

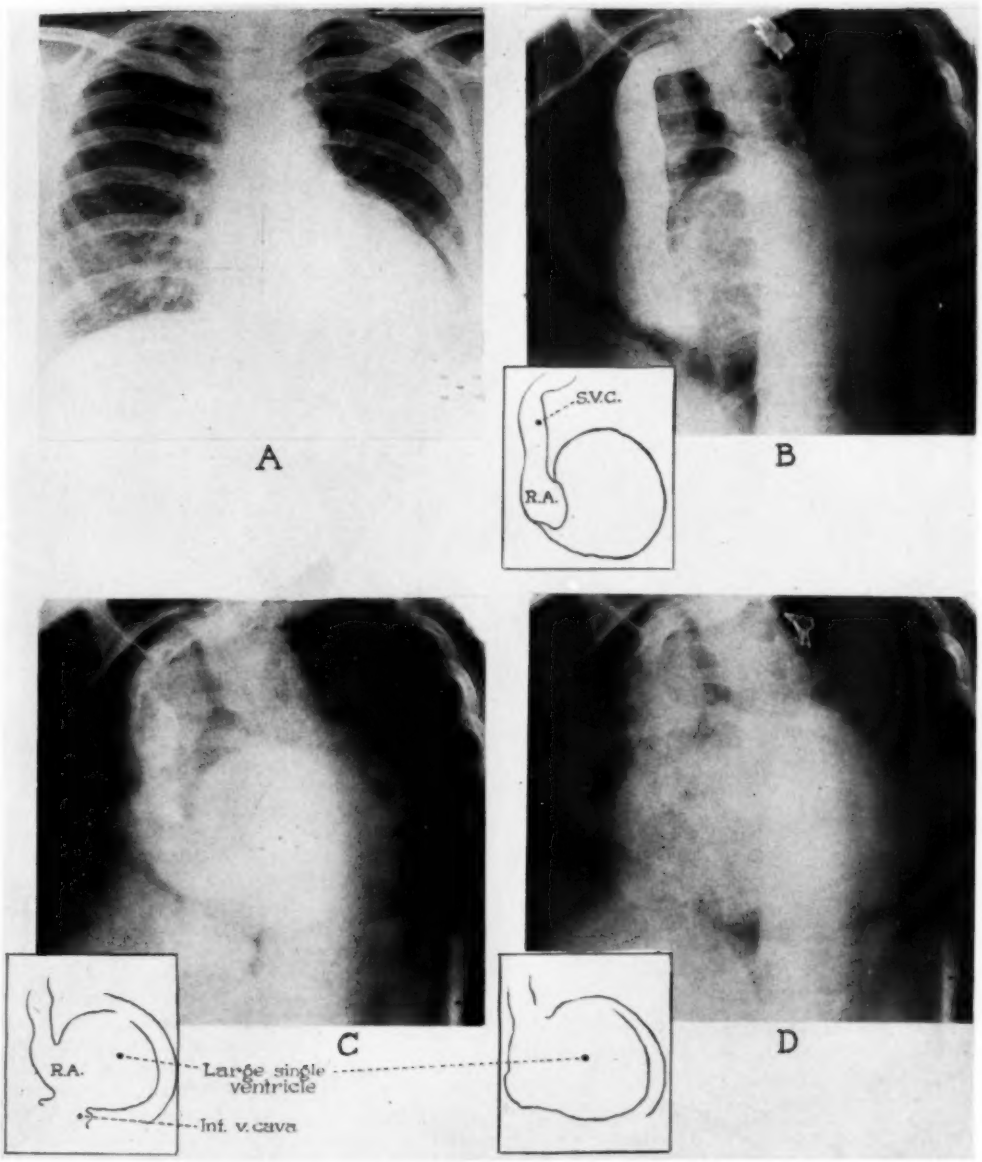

Fig. 7. Case 5: Tricuspid atresia without transposition of the great vessels. A. Conventional roentgenogram showing cardiac enlargement and concavity in the region of pulmonary artery. B, C, and D. Angiocardiograms demonstrating a large single ventricle. See text for detailed description.

At operation, the right pulmonary artery was seen to be normal in size but had a low pressure. Many collateral vessels entered the lungs. As the subclavian artery was being isolated, the heart stopped and failed to respond to resuscitative measures.

Figure 8 shows the heart as seen at autopsy. There was atresia of the tricuspid valve and a large interauricular septal defect. The right ventricle was represented by a tiny cavity which lay in the myocardium high on the anterior wall of the heart near the origin of the pulmonary artery. The left ventricle was a huge chamber with a thick myocardium. There was a small interventricular septal

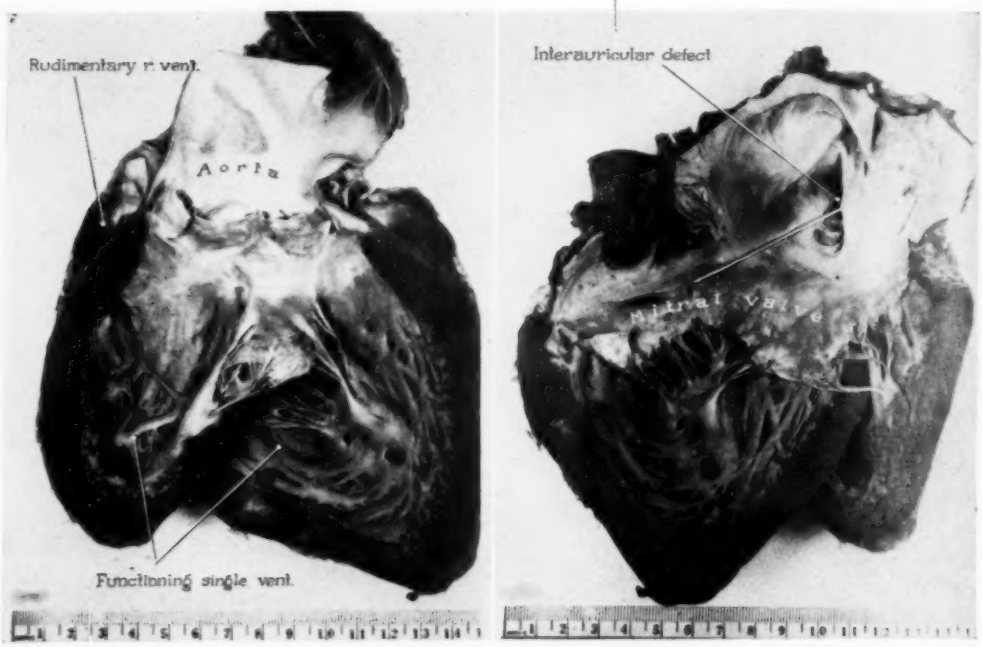

Fig. 8. Case 5: Tricuspid atresia without transposition of great vessels. Photographs of heart at autopsy (cf. Fig. 7) indicate a minute right ventricle.

defect. The right and left pulmonary arteries were of normal size and in life were filled through a patent ductus arteriosus.

Comment: This is the oldest patient in this series, and the compensatory changes in the heart over a long period made the clinical and angiocardiographic pictures confusing. Moreover, the angiocardiograms were obtained early in our series and are technically unsatisfactory. Despite this, it was apparent that the patient did not have a tetralogy of Fallot. The delayed passage of contrast solution through the heart had been interpreted as indicating some degree of myocardial insufficiency; autopsy confirmed this interpretation.

CASE 6: C. M., a 7-year-old white girl, had been cyanotic since the first week of life. Development had been slow, and the patient was three years old before she learned to walk. Her exercise tolerance was quite limited.

Physical examination showed marked clubbing of the fingers and toes and moderate cyanosis. The heart was not enlarged. A soft systolic murmur was heard in the third left interspace.

Fluoroscopy and conventional radiography (Fig. 9A) showed that the heart was not enlarged. Its contour suggested a diminutive or absent right ventricle. The rounded convex contour on the left upper border pulsated vigorously, and it was suspected that this represented the aorta. There was a left axis deviation. A diagnosis of tricuspid atresia with hypoplastic right ventricle was made, and angiocardiography was requested in order to determine the course of the aorta.

Two seconds after the beginning of the injection, the contrast solution entered the right auricle from the superior vena cava and there was considerable reflux into the inferior vena cava (Fig. 9B). The left auricle was partly outlined, and a faint concentration of the contrast substance was seen in the left ventricle. Reproduction of a film (Fig. 9C) made one second later shows good concentration in the large left ventricle. The wall of the left ventricle appeared to be thickened, but since the phase of cardiac contraction was not known, this appearance might be misleading. The course of the aorta was clearly outlined. It arched to the right but did not cross the midline, descending to its left. The region of the right ventricle failed to fill. The right pulmonary artery contained only a small amount of contrast solution and appeared reduced in size. Reproduction of a film (Fig. 9D) made in the lateral projection three seconds after the beginning of the injection shows that the general region of the right ventricle, which lies anteriorly, did not

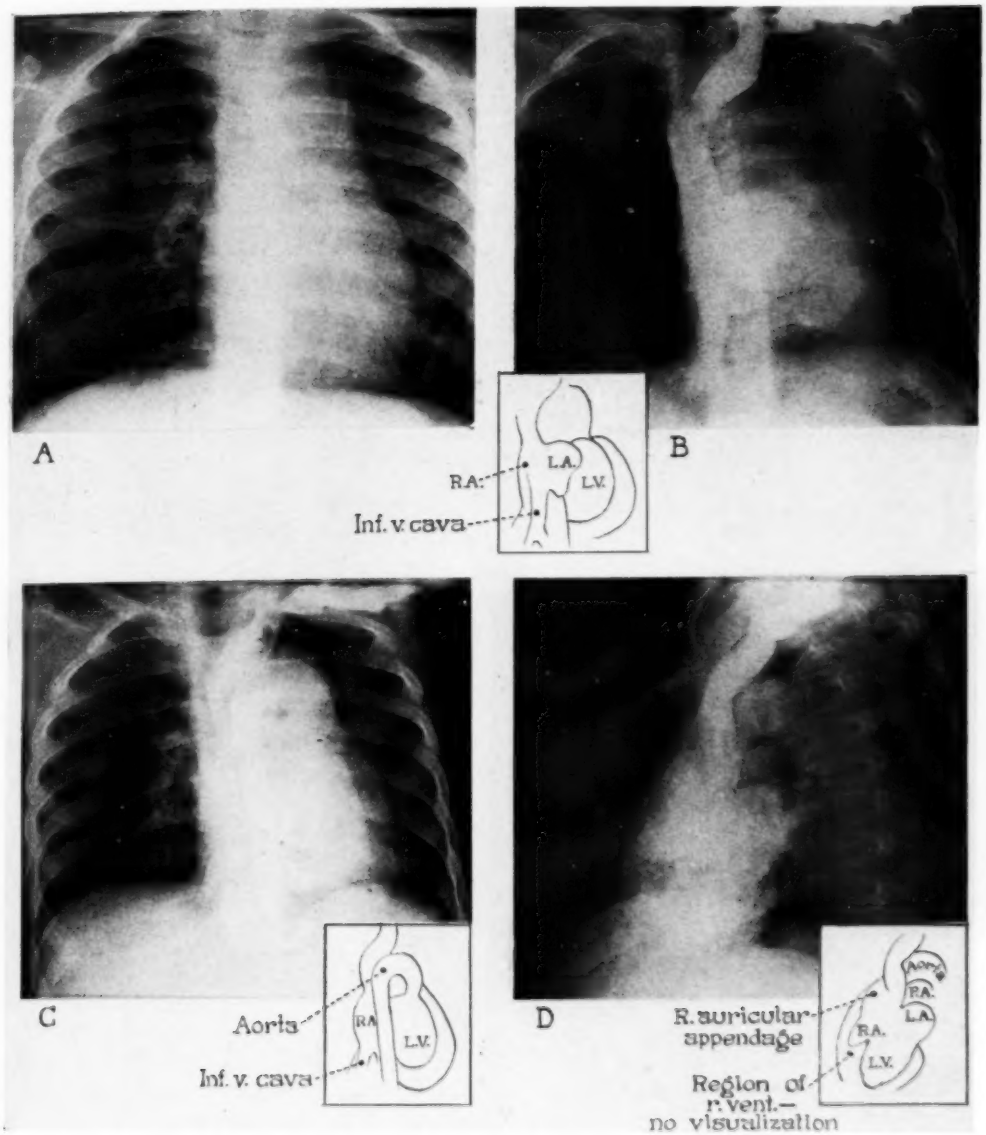

Fig. 9. Case 6: Tricuspid atresia without transposition of the great vessels. A. Conventional roentgenogram suggesting diminutive right ventricle. B. Angiocardiogram two seconds after injection. C. One second after "B," the course of the right aortic arch was outlined (retouched). D. Lateral view demonstrating failure of filling in region of right ventricle.

fill with contrast substance. The left ventricle and aorta, as well as the right auricle and left auricle, were clearly demonstrated. The pulmonary artery was not definitely identified.

It was thought from the angiocardiograms that the patient had an atresia of the tricuspid valve with a non-functioning right ventricle and a large interauricular septal defect.

A right thoracotomy was performed. Pressure in the pulmonary artery was low and the vessel was small. The presence of a right aortic arch was confirmed, and the right subclavian artery arising directly from the aorta was anastomosed to the right pulmonary artery. The course after operation was uncomplicated. Great improvement followed and has been maintained for more than eighteen months.

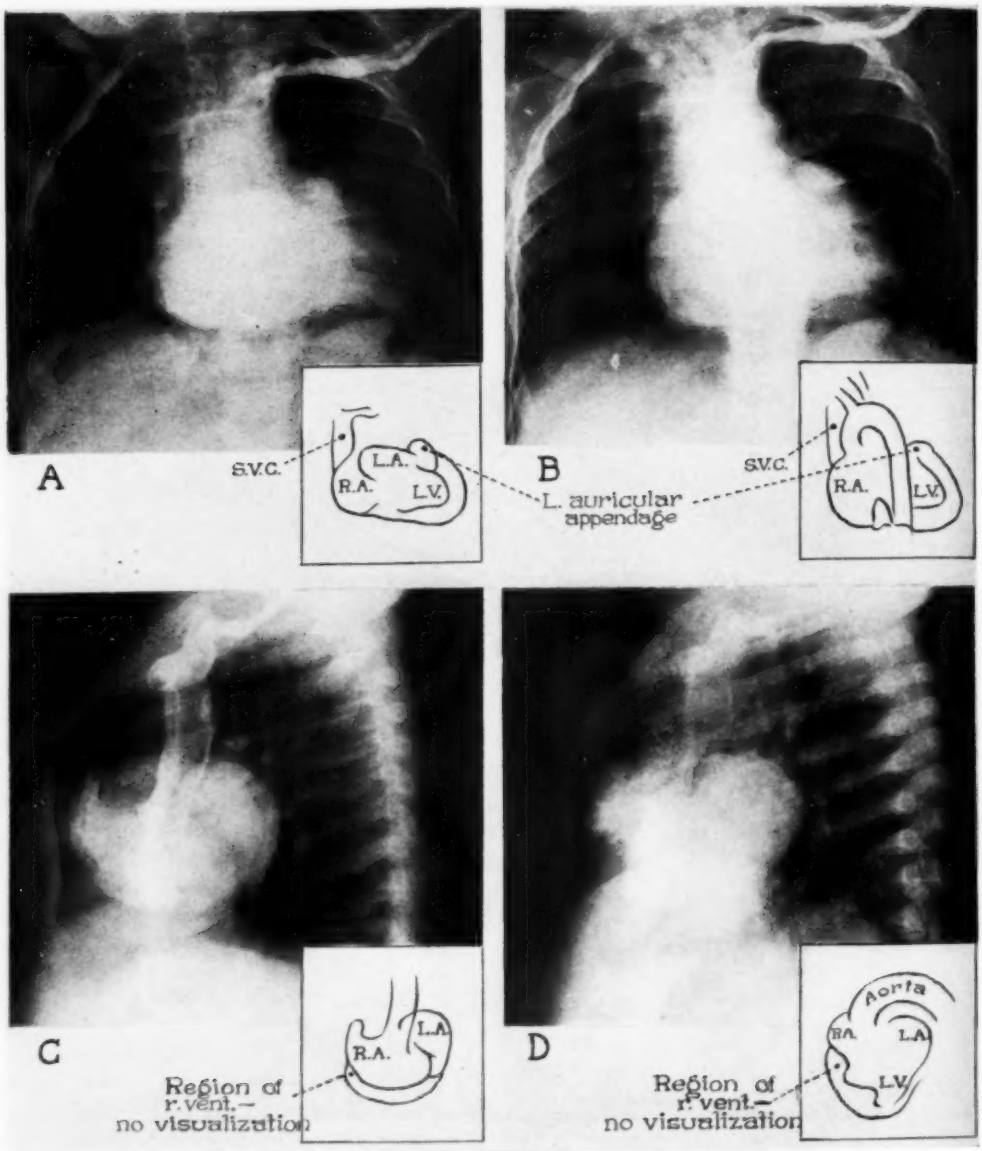

Fig. 10. Case 7: Tricuspid atresia without transposition of the great vessels (for description, see text). A. Angiocardiogram two seconds after injection. B. One second after "A." C. Lateral view two seconds after injection. D. One second after "C."

Comment: Angiocardiography provided the information requested concerning the course of the aorta and confirmed the clinical diagnosis of tricuspid atresia.

CASE 7: R. B., a 6-year-old white boy, had been cyanotic since birth. There was considerable impairment in his physical development. He was subject to attacks of unconsciousness associated with an increase in cyanosis. The heart did not seem to be enlarged, and there were no thrills or murmurs. Fluoroscopy and conventional radiography revealed a heart at the upper limits of normal size, with a concave pulmonary conus. There were hilar markings of moderate size which did not pulsate. Elec-

trocardiography showed left axis deviation. The clinical impression was tricuspid atresia with rudimentary right ventricle and pulmonic stenosis.

A film made two seconds after the beginning of injection (Fig. 10A) showed early filling of both the right and left auricles; a small amount of contrast substance entered the left ventricle. The interauricular septal defect was partially obscured by the well filled auricles. A small left auricular appendage was demonstrated. One second later (Fig. 10B) there was a high concentration of contrast solution in the left ventricle. The aorta filled, but the region of the right ventricle lying over the thoracic spine failed to fill. The angiocardiogram made in the lateral projection at the end of two seconds (Fig. 10C) showed filling of the left auricle, but the right ventricle was not identified. One second later (Fig. 10D) the left ventricle and the aorta were demonstrated but there was negligible opacification in the region of the right ventricle. The pulmonary artery was not seen in either projection. It was thought that angiocardiography confirmed the clinical diagnosis and that the interauricular defect was adequate in size.

At operation, the right subclavian artery was anastomosed to the side of the right pulmonary artery. Considerable improvement followed.

Summary of Findings in Group II-A: In none of the cases in Group II-A was the right ventricle visualized by angiocardiography, and the pulmonary arteries filled poorly or not at all. The lateral view provided the best evidence for non-filling of the right ventricle. The aorta filled well in all cases except one (Case 5). It is believed that secondary changes in this patient's heart over a period of twenty-five years resulted in myocardial insufficiency and left ventricular dilatation, obscuring the usual angiocardiographic picture.

In only one of the 10 patients was the left auricle not identified. In the 9 others an interauricular septal defect was inferred from the rapid passage of contrast substance from the right auricle into the left auricle. In one of these patients the interauricular defect was visualized directly.

B. Non-Visualization of the Right Ventricle with Transposition of the Great Vessels

There were 4 patients with non-visualization of the right ventricle and transposition of the great vessels. Two were studied postmortem, and a detailed report of one of these follows:

CASE 8: C. A. S., a 25-month-old white girl, was cyanotic at birth and her development was retarded. Physical examination, revealed a deformity of the left chest. There was a loud blowing murmur at the left sternal border, which was transmitted to the neck. The liver was enlarged. There was marked cyanosis with clubbing of the fingers and toes. Fluoroscopy and conventional radiography demonstrated a large heart with a large right superior vena cava and what was thought to be a large left ventricle. Because of the cardiac enlargement, the size of the other cardiac chambers could not be determined. Electrocardiography showed a left axis deviation but no evidence of hypertrophy of the left ventricle. No definite diagnosis could be made from the clinical observations, but it was suspected that the patient had a tricuspid stenosis or atresia.

Reproduction of a film made one second after the injection of opaque medium (Fig. 11A) shows a large left-sided vena cava. It followed the course of a dilated coronary sinus as it entered the right auricle. The film taken one second later (Fig. 11B) presented a complex appearance. Some of the contrast solution regurgitated up the right superior vena cava, which was of ample size. The ascending aorta was outlined; it extended far toward the right and seemed to displace the right superior vena cava. Contrast solution also entered the left auricle, and a faint concentration was seen far to the left, in the region of the left ventricle. A lateral film (Fig. 11C) made at the end of two seconds showed filling of the right and left auricles. Another structure beginning to fill was thought to be the left ventricle. Another film (Fig. 11D), made three seconds later, demonstrates the course of the aorta. It originated far anteriorly, and the portion of the heart from which it arose contained none of the contrast solution. The appearance was similar to that in Case 6. The left ventricle was opaque and it was assumed that the aorta filled in some manner from the left ventricle. The main pulmonary artery was not seen, and the small branches contained only a faint concentration of the contrast solution.

From the angiocardiographic findings it was thought that this patient had: (1) complete transposition of the aorta, arising entirely from the right ventricle; (2) tricuspid atresia with a small or nonfunctioning right ventricle; (3) pulmonic stenosis, (by inference, since the pulmonary arteries filled poorly), and (4) bilateral superior venae cavae.

At operation, the right auricle was located far posteriorly. The pressure in the right pulmonary artery was 350 mm. of saline, and the blood within the artery was quite dark. A right pulmonary vein was anastomosed to the right superior vena cava. The patient died approximately twenty-four hours after operation.

At autopsy (Fig. 1), the right ventricle was hypoplastic and the aorta originated from this ventricle. There was also a large interventricular septal defect, which was probably sufficient to allow an adequate

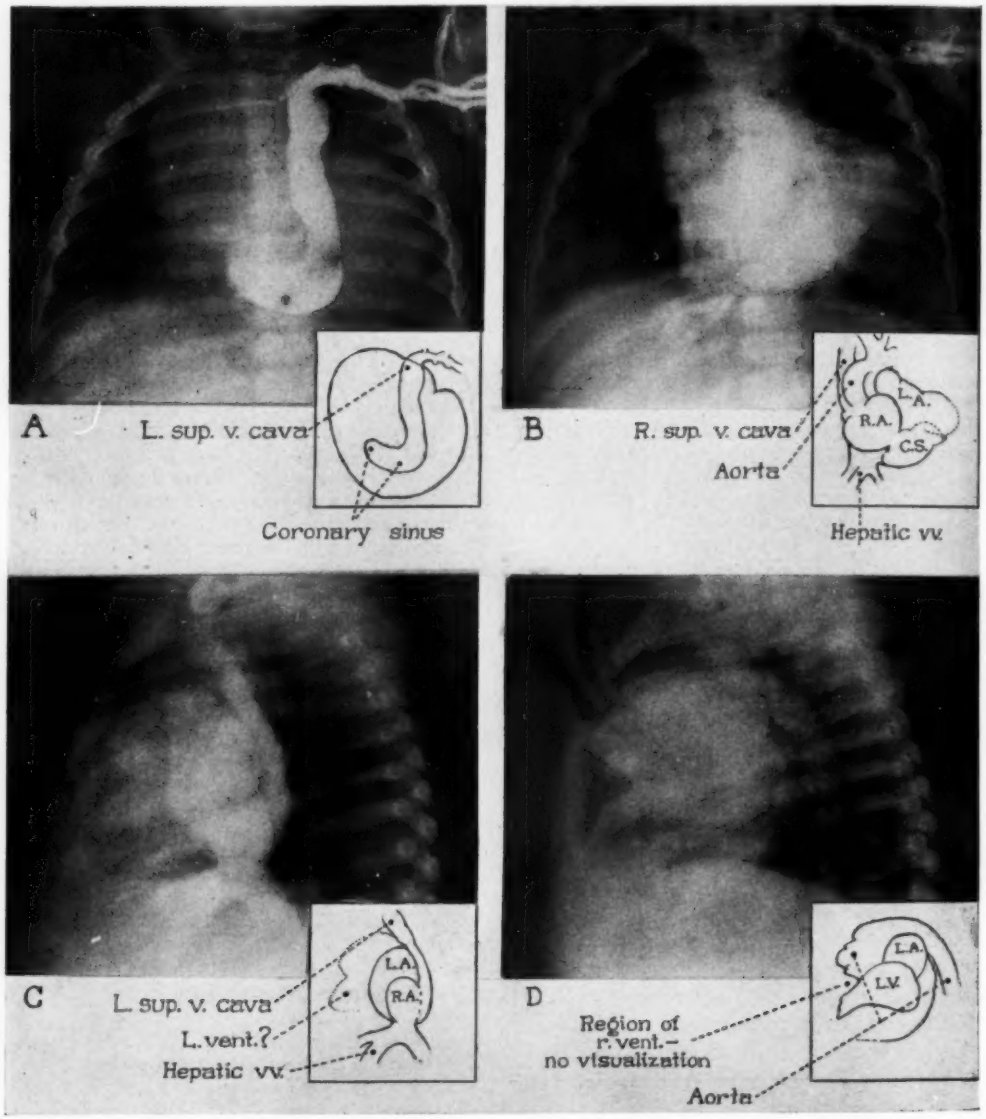

Fig. 11. Case 8: Tricuspid atresia with transposition of the great vessels. (Cf. drawing of autopsy specimen in Fig. 2). A. Angiocardiogram one second after injection. Note left superior vena cava. B. One second after "A" (see text). C. Lateral view two seconds after injection. D. Three seconds after "C" (see text).

systemic flow. The floor of the right auricle showed a small depression marking the site of the atretic tricuspid valve. The pulmonary artery arose entirely from the left ventricle. The orifice was small; the valve was bicuspid and presented definite stenosis. There was an interauricular septal defect of moderate size. Probably the stenosis of the pulmonary artery was the lesion which caused the greatest impairment to the efficiency of the heart.

Comment: Failure of the region of the right ventricle to fill in the lateral view indicated a rudimentary right ventricle. The presence of an interauricular septal defect tended to confirm this impression. The origin of the aorta far anteriorly indicated complete transposition of this vessel.

Summary of Findings in Group II-B: In all 4 cases of Group II-B the aorta filled promptly and originated far anteriorly, a finding which suggested that it was transposed. The rapid filling of the left auricle implied the presence of an interauricular septal defect in all cases. In 2 instances the pulmonary arteries filled promptly; failure to observe such filling suggested the presence of pulmonic stenosis. Case 8 exemplifies this point.

DISCUSSION

From the observations reported here, it appears that tricuspid stenosis or atresia with hypoplasia of the right ventricle constitutes one of the more promising fields of application for angiocardiographic methods. The changes that are observed are usually well defined and may be interpreted without great difficulty. The three principal features of the anomaly which are demonstrated by angiocardiography include: (1) the existence of an interauricular septal defect; (2) non-visualization of the right ventricle or visualization of a diminutive chamber; and (3) the presence of a large left ventricle. The demonstration of an interauricular septal defect is usually achieved most easily in the anteroposterior projection. There, the region of the left auricle may be seen filling almost immediately after the opacification of the right auricle. The changes within the right ventricle are most readily demonstrated in the lateral projection, where the anterior portion of the cardiac silhouette fails to visualize properly. The large left ventricle may be demonstrated well in either the anteroposterior or lateral projection. When the left ventricle is unusually large, it is sometimes difficult to distinguish it from an anatomically single ventricle. However, the speed of filling and the relative position of the aorta and pulmonary artery are usually helpful in clarifying the diagnosis.

In addition to structural changes within the heart, angiocardiography is often helpful in demonstrating any anomalies that exist within the great vessels. When such changes are found, the planning of surgical procedures for the correction of the disease is usually simplified.

Although angiocardiographic methods have been proved useful in tricuspid stenosis or atresia, it must be borne in mind that this procedure is only one of a variety that may be employed in the diagnosis of the disease. It must be remembered, too, that some patients may be examined by all available methods, including angiocardiography, venous catheterization of the heart, and the limited inspection which is possible at the operating table, without the determination of a precise anatomical diagnosis. In these instances the exact nature of the lesion may only be revealed by autopsy.

Since the desired information is not invariably provided by angiocardiography, we must balance its advantages against its risk. Large series of cases have been reported by others without serious complication. In over 300 patients studied by angiocardiography for various disorders and subjected to more than 600 injections of 70 per cent diodrast, we have had 3 deaths attributable to this procedure. Such a mortality rate may seem alarmingly high for a diagnostic method. It must be remembered, however, that more than two-thirds of the patients studied had congenital heart disease of a type that is often associated with severe and occasionally fatal reactions after such simple diagnostic maneuvers as fluoroscopy. These deaths occurred within twenty minutes after the injection of the diodrast and with respiratory failure as a prominent feature. In each instance an intravenous test dose of contrast substance had elicited no unusual reaction. Since two of the fatalities occurred after a second or third injection, it seems highly desirable to perfect the technical details of the procedure so that anteroposterior and lateral views may be secured simultaneously with a single injection. In any event, our experience indicates that angiocardiography should certainly not be used indiscriminately in all instances of congenital cyanotic heart disease, but only

after the careful selection of cases in which other clinical methods have failed to elicit the desired information.

In 19 of the 21 patients studied in our series, the presence of tricuspid stenosis or atresia was suspected clinically, with left axis deviation shown by electrocardiography as the most important finding. In the remaining 2 cases there was no previous evidence of tricuspid stenosis or atresia. In one of these (Case 4) a diagnosis of transposition of the great vessels had been made. Angiocardiograms, however, suggested a tricuspid stenosis and a hypoplastic right ventricle. In the other instance (Case 5) the electrocardiogram was confusing, and tetralogy of Fallot was considered a likely diagnosis. A large single ventricle was demonstrated. This merely served to exclude the presence of tetralogy of Fallot. In the light of later experience, however, a more precise diagnosis of tricuspid atresia might have been made. Thus, in 2 cases, angiocardiography provided new information and, in one of these, yielded a diagnosis which had not been previously suspected.

In the 19 cases with a clinical impression of tricuspid stenosis or atresia, the significant information elicited by angiocardiography may be summarized as: (1) clarification of impressions reached by other studies, (2) evaluation of the size of the interauricular septal defect, and (3) demonstration of anomalies of the great vessels, some of which had been unsuspected.

Although frequently confirming what had been previously suspected, angiocardiographic findings often were sufficiently typical to establish a diagnosis independently of other studies. The significant findings which made the diagnosis were: (1) demonstration of an interauricular septal defect, (2) non-visualization of the right ventricle or visualization of a diminutive chamber, and (3) demonstration of a large left ventricle. A large left ventricle is usually easily distinguished from an anatomical single ventricle in children; the distinction is apparently more difficult in adults (Case 5). The speed of filling and the relative position of the aorta and pulmonary artery provide confirming information and indicate the site of origin of these structures.

When surgical treatment is contemplated, a determination of the size of the interauricular septal defect is important. In one instance in which it was believed after angiocardiography that a small interauricular septal defect was present, there was evidence of elevated right auricular pressure after the creation of an artificial ductus arteriosus. Taussig (14) has pointed out that, with an interauricular defect smaller than the opening of the normal tricuspid orifice, it is difficult for the right auricle to expel its blood. When one establishes an artificial ductus arteriosus and thereby increases the pulmonary venous return to the left auricle, the emptying of the right auricle seems even more impaired, with consequent increase in venous pressure and liver enlargement.

As in other cardiovascular conditions where surgery is contemplated, determination of the side on which the aorta descends is essential to rational surgical planning. This determination is generally possible by fluoroscopy after barium swallow; in the few instances where this technic was inconclusive, the use of angiocardiography provided reliable information. Moreover, it frequently revealed unsuspected anomalies of the great veins, some of which were of surgical significance.

The patients in this series have been classified according to "visualization" or "non-visualization" of the right ventricle. While this is convenient in the segregation of cases, it must be remembered that negative findings by angiocardiography do not necessarily mean absence of a structure. Non-visualization of a given structure, for example, may mean that it does not communicate with the blood stream and cannot possibly fill; it may indicate, as well, that the roentgenogram was exposed at a time unsuitable for demonstration of the structure in question. Hence, one must be cautious in using synonymously the term "absence" and "non-visualization."

The diagnosis and treatment of congenital heart disease constitute a rapidly expanding field of medical science. The role of angiocardiography within this field is still under investigation. Technical improvements and further experience will increase its value. Its usefulness has been definitely established, however, as a procedure that often will furnish information which cannot be obtained by other means. The exact indications for its use have not been determined. Our experience indicates that tricuspid stenosis or atresia with hypoplastic right ventricle is one condition which can be satisfactorily demonstrated by the technic.

SUMMARY

The angiocardiographic findings in 21 instances of tricuspid stenosis or atresia have been reviewed. In 5 patients the findings were checked by postmortem examination. The cases were divided on the basis of "visualization" and "non-visualization" of the right ventricle by angiocardiography. They were further divided according to presence or absence of transposition of the great vessels. Examples of each group are described. The presence of an interatrial septal defect was inferred in all instances and was directly demonstrated in three.

Although angiocardiography provided vital information which had been previously unsuspected in only 2 of the 21 patients, its value as a corroborative technic in all cases could not be questioned, and in many instances it disclosed additional anomalies of surgical importance. For example, an unusual course of the aorta was demonstrated on three occasions. Information was also provided concerning the functional capacity of certain hearts.

The role of angiocardiography in the diagnosis of congenital cyanotic heart disease has been discussed and the risk of the procedure briefly evaluated.

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REFERENCES

1. ALEXANDER, F., AND WHITE, P. D.: Four Important Congenital Cardiac Conditions Causing Cyanosis to be Differentiated from the Tetralogy of Fallot: Tricuspid Atresia, Eisenmenger's Complex, Transposition of the Great Vessels, and a Single Ventricle. Ann. Int. Med. **27:** 64–83, July 1947.
2. BLALOCK, A., AND TAUSSIG, H. B.: Surgical Treatment of Malformations of the Heart in Which There is Pulmonary Stenosis or Pulmonary Atresia J. A. M. A. **128:** 189–202, May 19, 1945.
3. CARSON, M. J., BURFORD, T. H., SCOTT, W. G., AND GOODFRIEND, J.: Diagnosis of Pulmonary Stenosis by Angiocardiography. J. Pediat. **33:** 525–543, November 1948.
4. CASTELLANOS, A., PEREIRAS, R., AND ARGELIO GARCIA: Angio-cardiographies in Newborn. Bol. Soc. cubana de pediat. **10:** 225–244, May 1938.
5. CHAVEZ, I., DORBECKER, N., AND CELIS, A.: Direct Intracardiac Angiocardiography; Its Diagnostic Value. Am. Heart J. **33:** 560–593, May 1947.
6. COOLEY, R. N., BAHNSON, H. T., AND HANLON, C. R.: Angiocardiography in the Diagnosis of Congenital Heart Disease of Cyanotic Type with Pulmonic Stenosis. I. Observations on the Tetralogy of Fallot and "Pseudo-Truncus Arteriosus." Radiology **52:** 329–345, March 1949.
7. DUNSKY, I.: Tricuspid Atresia, Hypoplastic Transposed Aorta and Associated Defects of a Trilocular Heart. Arch. Path. **43:** 412–416, April 1947.
8. GIBSON, S., AND CLIFTON, W. M.: Congenital Heart Disease; Clinical and Postmortem Study of 105 Cases. Am. J. Dis. Child. **55:** 761–767, April 1938.
9. MANHOFF, L. J., JR., AND HOWE, J. S.: Congenital Heart Disease: Tricuspid Atresia and Mitral Atresia Associated with Transposition of the Great Vessels; Report of 2 Cases. Am. Heart J. **29:** 90–98, January 1945.
10. POTTS, W. J., SMITH, S., GIBSON, S.: Anastomosis of the Aorta to a Pulmonary Artery. Certain Types in Congenital Heart Disease. J. A. M. A. **132:** 627–631, Nov. 16, 1946.
11. ROBINSON, A., AND HOWARD, J. E.: Atresia of the Tricuspid Valve with Transposition of the Great Vessels. Am. J. Dis. Child. **75:** 575–581, 1948.
12. SUSSMAN, M. L., GRISHMAN, A., AND STEINBERG, M. F.: Newer Concepts in the Diagnosis of Congenital Heart Disease. Am. J. Dis. Child. **65:** 922–936, June 1943.
13. TAUSSIG, H. B.: Clinical and Pathological Findings in Congenital Malformations of the Heart Due to Defective Development of the Right Ventricle Associated with Tricuspid Atresia or Hyoplasia. Bull. Johns Hopkins Hosp. **59:** 435–445, December 1936.
14. TAUSSIG, H. B.: Congenital Malformations of the Heart. New York, The Commonwealth Fund., 1947.

SUMARIO

La Angiocardiografía en la Cardiopatía Congénita de Forma Cianótica. II. Observaciones sobre la Estenosis de la Tricúspide o Atresia con Hipoplasia del Ventrículo Derecho

En 21 casos de estenosis o atresia tricuspidiana los hallazgos angiocardiográficos fueron repasados, y en 5 enfermos cotejados con el examen autópsico. En los de-

más, eran típicos del estado y el diagnóstico estaba respaldado por métodos tales como la electrocardiografía y el cateterismo venoso.

Los casos aparecen divididos conforme a si la angiocardiografía visualiza o no el ventrículo derecho y subdivididos conforme a la presencia o ausencia de transposición de los grandes vasos, describiéndose y reproduciéndose ejemplos de cada grupo. En todos los casos, se infirió la existencia de una deformación del tabique interauricular, observándose directamente su presencia en tres de ellos.

Aunque la angiocardiografía aportó información capital que sólo en 2 de los 21 pacientes había sido insospechada antes, no cabe dudar su valor como técnica corroborante en todos los casos. Los hallazgos significativos son: observación de una deformación del tabique interauricular; falta de visualización del ventrículo derecho o visualización de una cámara empequeñecida; observación de un ventrículo izquierdo agrandado. En muchos casos notáronse otras anomalías de importancia quirúrgica; por ejemplo, en tres ocasiones, trayecto extraño de la aorta. También se obtuvo información relativa a la capacidad funcional de ciertos corazones.

Si bien hay comunicadas series numerosas de casos en que se empleara la angiocardiografía sin complicaciones graves, lo observado por los AA. en más de 300 enfermos con varios trastornos, sometidos a más de 600 inyecciones de diodrasto al 70 por ciento, comprende 3 muertes imputables al procedimiento. Dos de esos percances fueron consecutivos a la segunda o tercera inyección.

De lo anterior, se desprende que no debe usarse jamás la angiocardiografía indistintamente en todo caso de cardiopatía cianótica congénita, sino que hay que seleccionar meticulosamente los casos en que otros métodos clínicos no han proporcionado los datos deseados.

A Simple Serialographic Technic for Cerebral Angiography[1]

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THE IMPORTANCE of serial films in the angiographic study of the intracranial circulation has been well established. A number of investigators (1–4) have developed devices which permit the exposure of a series of films in rapid succession and thereby facilitate the recording of all phases of the cerebral circulation—arterial, capillary, and venous. Fineman (3) reviewed a number of these devices and described one of his own. Unfortunately, most of the mechanisms which have been used are complicated or expensive, and are therefore impractical in many institutions.

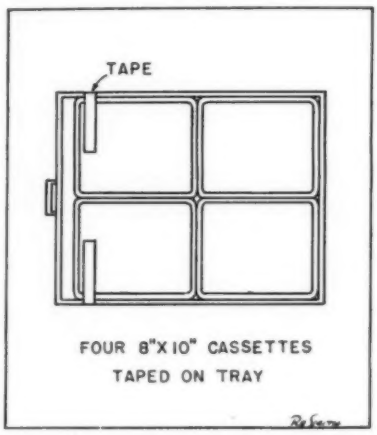

Fig. 1. Diagram of Bucky tray containing four 8 × 10-inch cassettes. Note the absence of the cassette clamps and centering device.

At the Cincinnati General Hospital we have developed a serialographic technic which is simple and inexpensive, and utilizes only standard materials which are easily available.

The method permits the successive exposure of four 8 × 10-inch films in about six seconds. The cassettes are arranged in a Bucky tray, two on each side, in the manner demonstrated in Figure 1. A lead sheet with an 8 × 9-inch opening (Fig. 2) is placed on top of the radiographic table, and the patient's head is positioned over this aperture. During the angiographic procedure the Bucky tray is manually shifted about so that the four films come successively under the opening in the lead sheet and are separately exposed. The moving Bucky grid is utilized during each filming, and is cocked between exposures by means of a stout extension cord tied to the Bucky cocking lever (Fig. 3).

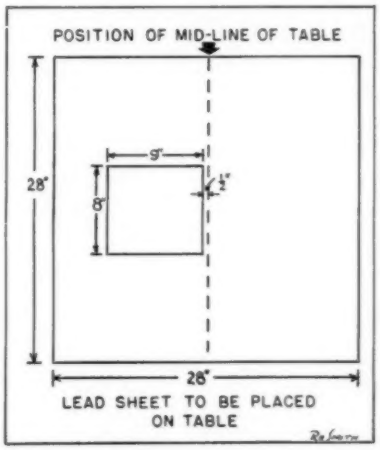

Fig. 2. Diagram showing dimensions of the lead sheet and position of the rectangular opening.

With a little practice, a team of two technicians, using this method, can produce consistently good serial intracranial angiograms (Figs. 4–6).

DETAILS OF TECHNIC

Materials: The lead sheet consists of a 28-inch square, 2 mm. thick, in which a rectangular 8 × 9-inch aperture has been eccentrically cut as indicated in Figure 2. The Bucky tray used in this procedure is slightly modified from the usual design, in that the centering device and cassette

[1] From the Department of Radiology and the Division of Neurosurgery, Department of Surgery, University of Cincinnati College of Medicine. Accepted for publication in July 1949.

clamps are lacking. This modification is necessary in order to make room for the four 8 × 10-inch cassettes. A tray of the desired type can be obtained at low cost from x-ray equipment dealers, or can be easily improvised.

Preliminary Procedure: The following steps are taken before the patient is brought to the radiographic room:

(4) Four cassettes are placed in the special Bucky tray, the two outside cassettes being taped in position to prevent sliding. The tray is shifted about so that each cassette comes directly under the opening in the lead sheet. Small strips of adhesive tape are placed on the tray and on the side of the radiographic table to indicate the exact position of the tray for

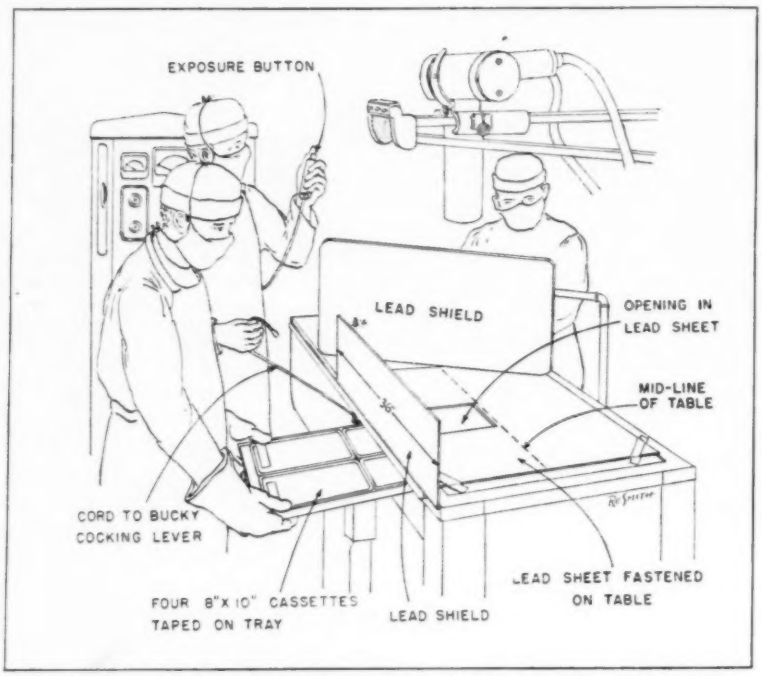

Fig. 3. Set-up for the angiographic procedure. Note the position of the lead sheet on the radiographic table. The two x-ray technicians stand on the left, and the surgeon is on the right. The patient is not included in the drawing, but in the actual procedure his head would be positioned over the opening in the lead sheet.

(1) The regular Bucky tray is replaced by the modified tray.

(2) The lead sheet is firmly taped down near one end of the x-ray table with the rectangular aperture located in the position indicated in Figure 3. The opening must be on the same side of the midline of the table as the Bucky controls.

(3) A cone which produces a 10-inch circle at 40-inch target-film distance is attached to the x-ray tube. Its chief purpose is to prevent direct radiation from extending over the outer edges of the lead sheet.

centering each of the four cassettes beneath the aperture in the lead sheet. These strips of tape mark the predetermined positions of the tray for the lateral angiogram. Since the anteroposterior angiogram is made with a caudal tilt of the x-ray tube, a second series of positions is determined and marked, allowing for this angulation. Lead numbers are placed on the cassettes in the proper sequence.

(5) A stout cord about 3 feet in length is tied to the Bucky cocking lever. This will enable a technician to cock the Bucky diaphragm between exposures in a mini-

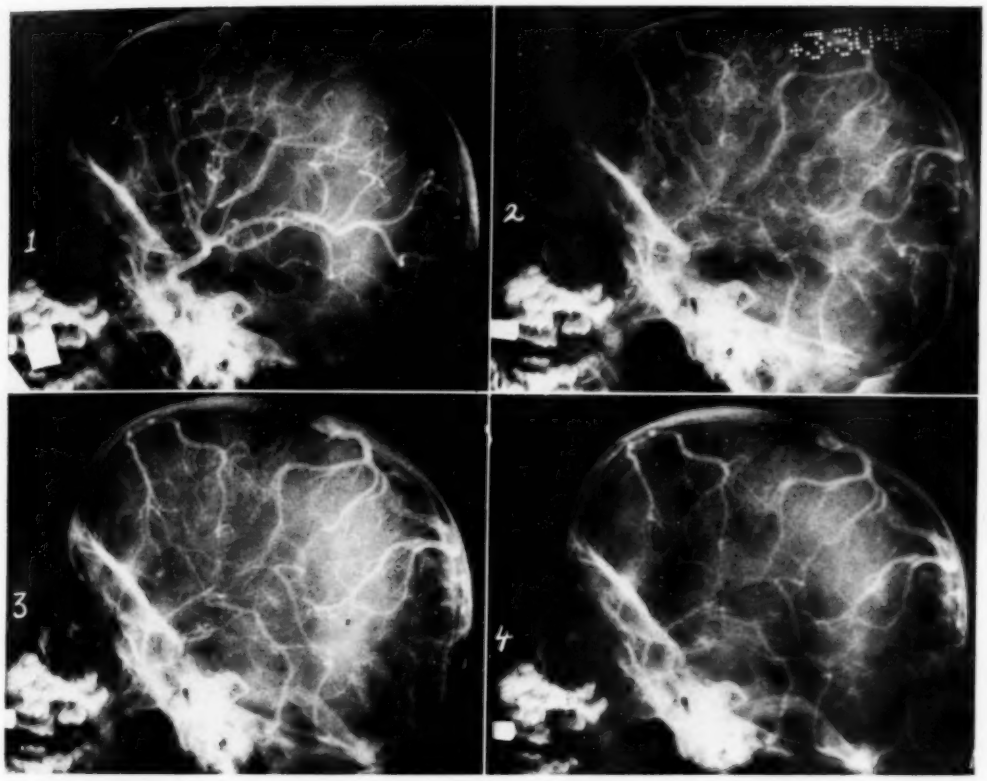

Fig. 4. Serial intracranial angiogram of a 5-year-old female child, lateral projection. Twelve cubic centimeters of 35 per cent diodrast were used. Note the demonstration of the arteries, veins, and venous sinuses.

mum of time and with little interference to other personnel.

Angiographic Procedure: The patient's head is secured in the true lateral position over the opening in the lead sheet. The contrast medium is rapidly injected into the carotid artery, and the first exposure is made at a signal from the surgeon when about two-thirds of the dye has been injected. The Bucky tray is then shifted about as rapidly as possible to the predetermined positions and each of the three subsequent exposures is made on command from the technician positioning the tray.

If stereo films are desired, the x-ray tube is shifted and the injection and procedure are repeated.

The patient's head is then turned to the anteroposterior position. The x-ray tube is angled 20 to 25 degrees caudally and centered to the opening in the lead sheet. The angiographic procedure is repeated in the same manner, except that the predetermined positions of the tray for the anteroposterior view are used.

Duties of Technicians: In the performance of this procedure, the services and teamwork of two technicians are required. The duties of the first technician are: to determine the various positions of the Bucky tray for the exposure of the four films; to move the tray rapidly to these positions during the angiographic procedure; and to signal the second technician at the proper time for each of the last three exposures. The duties of the second technician are: to make the four exposures on signal and to pull the Bucky cocking lever by means of the extension cord between exposures.

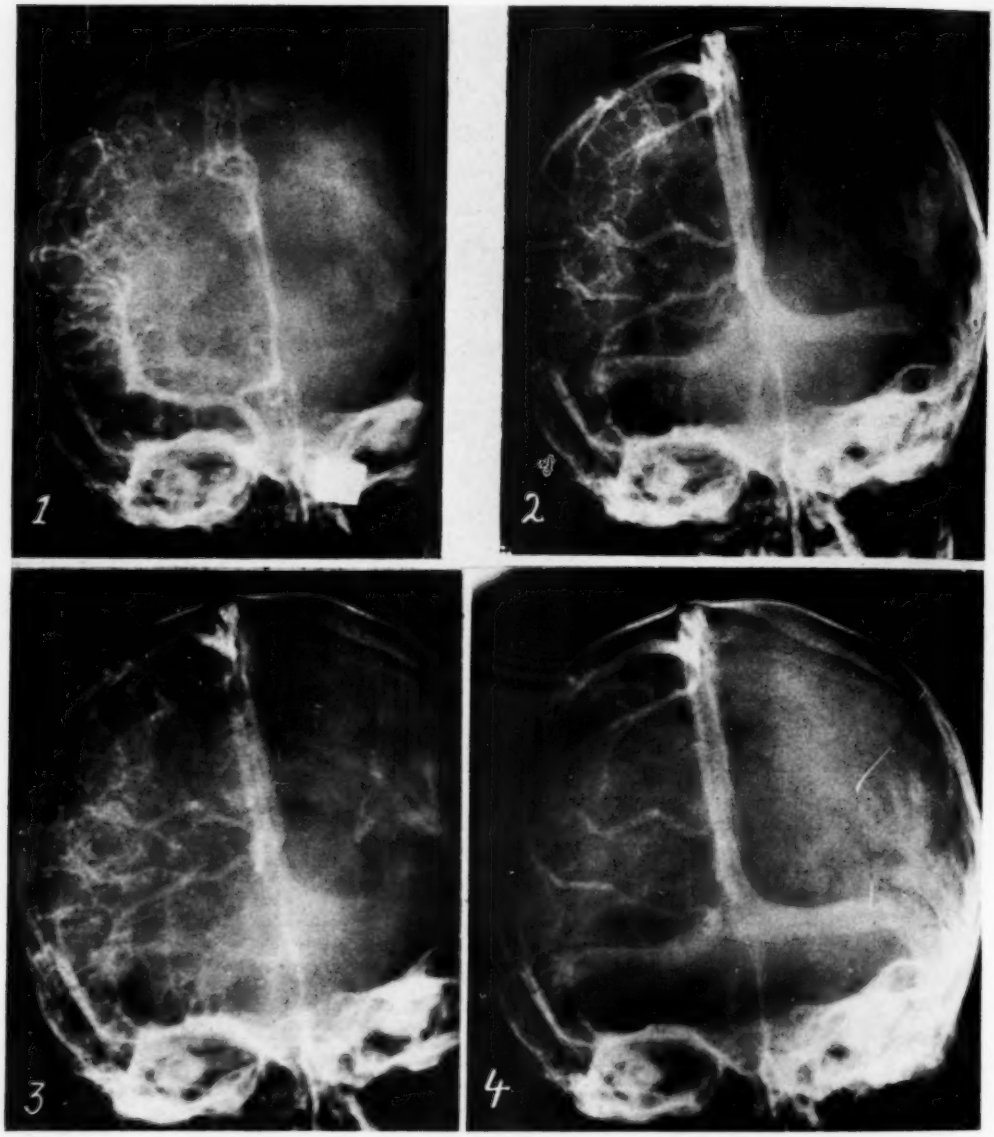

Fig. 5. Serial anteroposterior angiogram of the patient shown in Figure 4.
There is an error in the sequential marking of this series, numbers 2 and 3 being reversed.

Alternative Methods: If for some reason it is not possible for one person to carry out simultaneously the two duties of making the exposures and cocking the Bucky mechanism, a third technician may be needed for the latter duty. If a third technician is not available, satisfactory results can be obtained by the use of a stationary grid, or by setting the travel time of the Bucky grid at seven or eight seconds and making the four exposures during a single movement of the Bucky mechanism. If either of these methods is utilized, however, grid lines will be apparent on the films. Also, in the use of the single movement technic, the timing of the first expo-

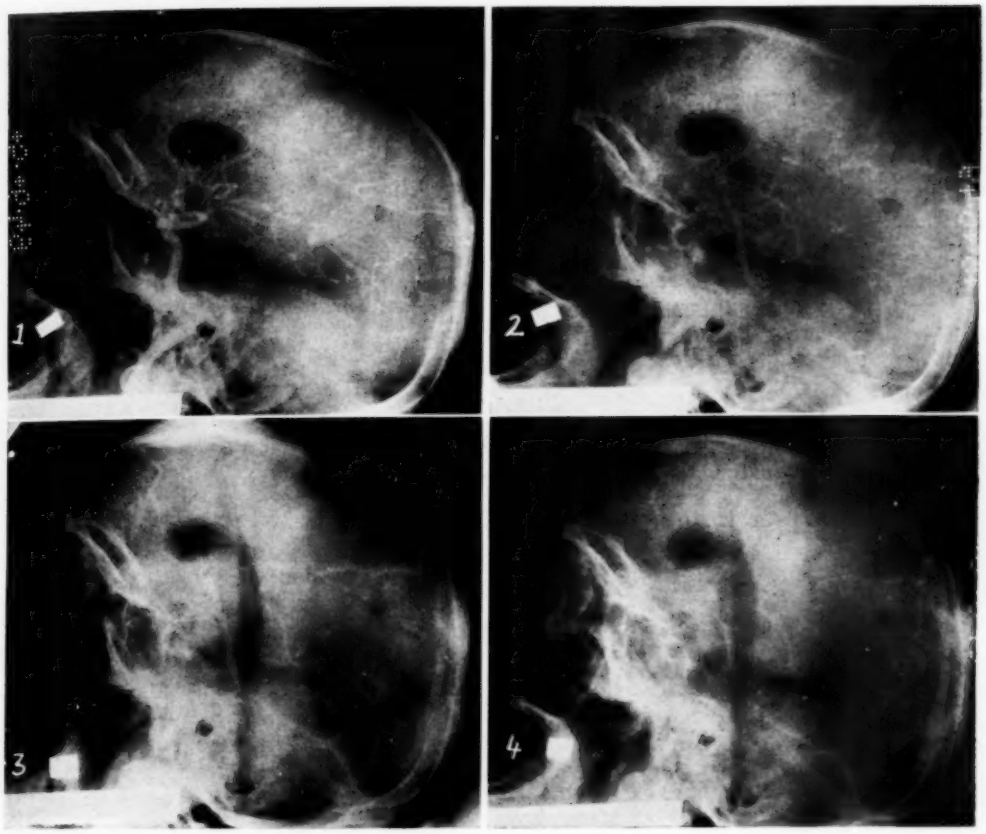

Fig. 6. Serial intracranial angiogram of a 60-year-old male, lateral projection. Twelve cubic centimeters of 35 per cent diodrast were used. Some air is still present in the ventricular system from a previous air encephalogram.

sure may be late, since there is an appreciable lag (amounting to over 0.25 second) between the beginning of the movement of the Bucky diaphragm and the emission of x-rays. If, however, the technician presses the exposure button at the beginning of the injection of the contrast medium instead of near the end, this difficulty can be avoided.[2]

If a modified Bucky tray of the type described is not available, excellent angiograms can be obtained by the exposure of the four quadrants of a single 14 × 17-inch film. If this is done, the opening in the lead sheet must, of course, be smaller than that described for 8 × 10-inch cassettes, and in some cases the entire skull cannot be projected on a single quadrant of a 14 × 17-inch film. If, however, the skull is of average size, and if very accurate positioning is accomplished, the results with a single 14 × 17-inch film are almost equal to those with four 8 × 10-inch films.

Technical Factors: The technical factors which we use are as follows: 200 ma.; 0.25 second exposure time; 80–100 kv.p. (depending on the position and thickness of the skull); 40-inch target-film distance.

Protection: Lead aprons are worn by all personnel, and lead gloves are used by the technician shifting the Bucky tray. The surgeon and the technician shifting the tray are also protected by sheets of lead interposed between them and the field of exposure (Fig. 3). The cone, which sharply

[2] A reciprocating Bucky diaphragm would simplify the procedure, but is not essential.

delimits the primary beam, is also an important protective device for all personnel.

SUMMARY

A simple and inexpensive method of obtaining four serial films in six seconds during intracranial angiography is described. The technic is adaptable to almost any radiographic set-up.

NOTE: Grateful acknowledgment is made to our technician, Mr. Charles Butler, for his assistance in helping to develop this technic and to Mr. Robert Smith for his preparation of the diagrams.

REFERENCES

1. EGAS MONIZ: Résultats cliniques et physiologiques de l'angiographie cérébrale. Schweiz. med. Wchnschr. **65:** 1112–1115, Nov. 23, 1935.
2. EGAS MONIZ: L'évolution de la technique de l'angiographie cérébrale. Progrès méd., pp. 1777–1781, Nov. 17, 1934.
3. FINEMAN, S.: A Practical Serialograph for Intracranial Angiography. Am. J. Roentgenol. **61:** 324–334, March 1949.
4. SANCHEZ-PEREZ, J. M.: The Cranial Seriograph and Its Utility in Neurologic Radiology for Cerebral Angiography. Surgery **13:** 661–666, May 1943.

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SUMARIO

Sencilla Técnica Serialográfica para la Angiografía Intracraneal

El sencillo y poco costoso método descrito en este trabajo permite obtener cuatro radiografías seriadas en seis segundos durante la angiografía intracraneal. La técnica es adaptable a casi todas las instalaciones radiográficas. Los chassis van, dos en cada lado, en una bandeja de Bucky. Encima de la mesa radiográfica se coloca una hoja de plomo con una abertura de 20 × 22.5 cm., en la cual encaja la cabeza del enfermo. Durante la angiografía, se desvía a mano la bandeja de Bucky, de modo que las cuatro placas pasen sucesivamente por la abertura de la hoja de plomo y queden expuestas por separado. Durante cada radiografía se utiliza la rejilla movible de Bucky, montándose entre exposiciones por medio de un recio cordón unido a la palanca descargadora de Bucky. Si se desean estereorradiografías, se desvía el tubo de rayos X y se repite el procedimiento.

The Use of Gastric Mucin as a Barium Suspension Medium

A Preliminary Report[1]

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THERE HAS BEEN a continuous search for improved contrast media for use in the roentgen study of the gastro-intestinal tract. Substances such as thorotrast emulsion and tetraiodophthalimidoethanol have been investigated and found to give improved visualization of mucosal patterns but have not been of clinical value to date. In consideration of these investigations, the thought was advanced that barium sulfate is basically a satisfactory contrast medium, that the particle size is small, and that the defects in its use are related to the *miscibility of the suspending medium with the coat of mucus which lines the gastro-intestinal tract.* There is little information available regarding the physical character of this coat, except for the statement that its adhesive properties are due to the presence of mucin in some type of aqueous solution.

An investigation of the visualization of mucosal patterns with barium sulfate suspended in an aqueous solution of mucin was initiated. Two grams of mucin were dissolved in water, and this solution was used to prepare 250 c.c. of barium mixture containing 125 gm. of barium sulfate. It was found that this preparation formed a rather persistent coating on the tongue, and it was hoped that a similar effect would be noted in the gastro-intestinal tract. The mixture proved to be rather viscous but, nevertheless, was slightly more acceptable to patients than conventional barium mixtures, possibly because of its less "chalky" or "gritty" consistency. This mixture also showed less tendency to sedimentation than conventional barium mixtures.

Study of the upper gastro-intestinal tract showed no appreciable change in the esophagus and stomach as compared to examinations with the usual barium mixtures. The small intestinal pattern, however, showed greater delicacy of detail and a more desirable distribution of the barium meal as compared to control cases. Two hours appeared to be the optimum time for demonstration of the small intestine in most instances, and at this time it was frequently possible to visualize large portions of both the jejunum and ileum. Four typical roentgenograms are reproduced in Figure 1.

The value of mucin in barium enemas was also investigated. Approximately 4 gm. of mucin were added to the usual barium-water mixture. In this connection, it was noted that there was no significant improvement in the outline of the colon aside from a somewhat lessened tendency for the barium to sediment out. However, in those instances where reflux of barium occurred through the ileocecal valve, improvement in the small intestinal pattern was evident. An occasional rather striking pattern was obtained, one of which is reproduced (Fig. 2).

It is apparent that a fuller knowledge of the physicochemical character of the mucous lining of the gastro-intestinal tract may allow the development of improved technics. Careful adjustment of the concentration and pH may be of value. The addition of other substances may enable the suspension medium to penetrate the lining coat and produce finer detail.

[1] Accepted for publication in July 1949.

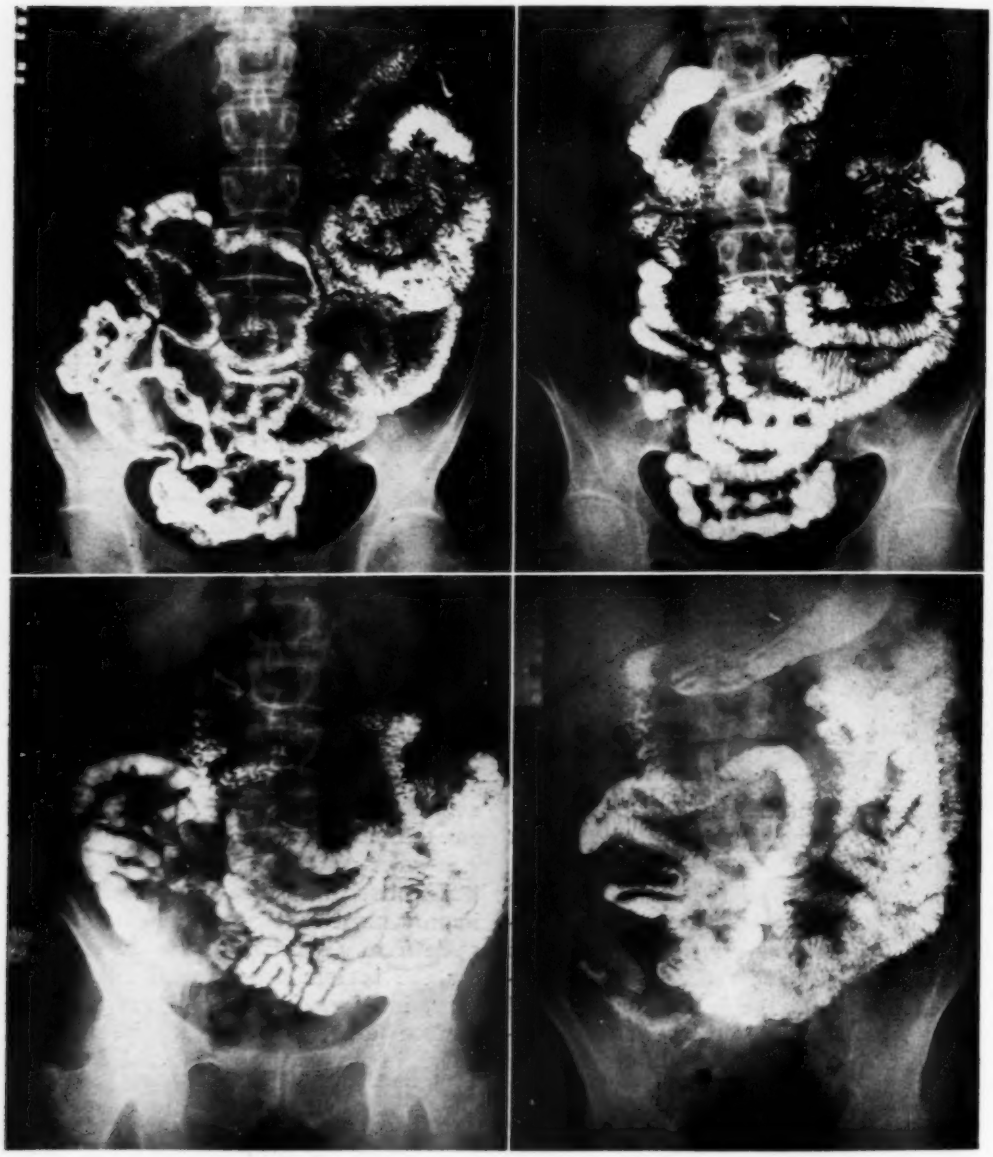

Fig. 1. Four typical roentgenograms of the normal small intestine obtained with the use of gastric mucin.

This preliminary report has been limited to essentially normal cases. Further studies will be conducted to determine if this medium is of value in pathological conditions and if modifications can be made in the mixture to produce further improvement.

REFERENCE

JONES, GLENN E., ET AL.: Iodinated Organic Compounds as Contrast Media for Radiographic Diagnoses. VIII. Studies on Tetraiodophthalimidoethanol as a Medium for Gastro-Intestinal Visualization. Radiology **49:** 143–150, August 1947.

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Fig. 2. Roentgenogram of small intestine following reflux of barium-mucin enema through the ileocecal valve.

SUMARIO

El Empleo de la Mucina Gástrica como Medio para las Suspensiones de Bario: Comunicación Preliminar

Con una mezcla de bario, que representaba 250 cc., preparada de una solución acuosa de 2 gm. de mucina gástrica y 125 gm. de sulfato de bario, quedó revelado el patrón del intestino delgado con detalles más delicados y obtúvose distribución más satisfactoria del bario, que con las habituales suspensiones de bario.

La adición de 4 gm. de mucina a la mezcla corriente para enemas de bario no introdujo mayor claridad en el contorno del colon, pero en los casos en que hubo reflujo del medio a través de la válvula ileocecal, mejoró la imagen del intestino delgado.

Este estudio se limitó a casos normales.

Use of Micropulverized Barium Sulfate in X-Ray Diagnosis

A Preliminary Report[1]

WILLIAM ADOLPH, M.D., and GEORGE V. TAPLIN, M.D.

IN THE ROUTINE use of powdered barium sulfate as a radiopaque material, the importance of a critical particle size range has not been reported, although it has long been known that the phenomenon of adsorption is intensified as particle size is decreased (1). Barium sulfate powder has been suspended in various colloidal substances to aid in "sedimentation of barium precipitate on the gastro-intestinal mucosa" (2, 3). Powdered barium sulfate has been mixed with tannic acid (4), gum acacia (5), and gelatin (6), the chief purposes of such mixtures being to obtain a preparation sufficiently radiopaque to permit fluoroscopic examination and to coat the intestinal mucosa with just enough adherent radiopaque material simultaneously to permit optimal x-ray visualization. Available preparations do not fulfill both criteria completely.

The possible value of micropulverizing barium sulfate was suggested during inhalation studies with antibiotic dusts (7). Particles 0.2 to 2.0 micra in diameter suspended in air have been shown to penetrate the entire pulmonary tree, with retention of a large percentage in the lungs (8). Also, the covering property of paints and pigments is enhanced by reduction of the particle size (9).

PARTICLE SIZE STUDIES

Preparations of barium sulfate were examined for particle size distribution by light and electron microscopy. Identical electron microscope examinations were made of five leading commercially available barium sulfate powders used for x-ray diagnosis. Figure 1A is an electron micrograph magnified approximately 2150 times of a typical commercial barium sulfate preparation. The particle size distribution in the same product before and after micropulverization by dry grinding is recorded in Table I and shown in Figures 1A and B. It is apparent that this milling process reduces the number of large particles (5 to 20 micra), and increases the concentration of small particles (.04 to .10 micron). Subsequently, particle size reduction has been accomplished more effi-

TABLE I: THE PARTICLE SIZE DISTRIBUTION OF A COMMERCIAL BARIUM SULFATE POWDER BEFORE AND AFTER MICROPULVERIZATION

Commercial			Range in Micra	Micropulverized		
Frequency Per Cent	Surface Per Cent	Weight Per Cent		Frequency Per Cent	Surface Per Cent	Weight Per Cent
12.1	0.002	0.000	0.04– 0.1	49.5	0.028	0.000
28.2	0.090	0.002	0.1 – 0.5	21.6	0.227	0.006
11.3	0.225	0.015	0.5 – 5.0	8.1	0.532	0.037
32.3	10.297	2.690	1.0 – 5.0	16.2	17.039	4.739
16.1	89.385	97.293	5.0 –20.0	4.5	82.173	95.219
Length mean diam.—3.2 microns Surface mean diam.—5.3 microns Weight mean diam.—6.9 microns				Length mean diam.—1.2 microns Surface mean diam.—2.9 microns Weight mean diam.—4.5 microns		

[1] From the Radiological Service and Investigative Medicine Service, Birmingham Veterans Administration Hospital, Van Nuys, Calif., and the Department of Medicine, School of Medicine, University of California at Los Angeles.

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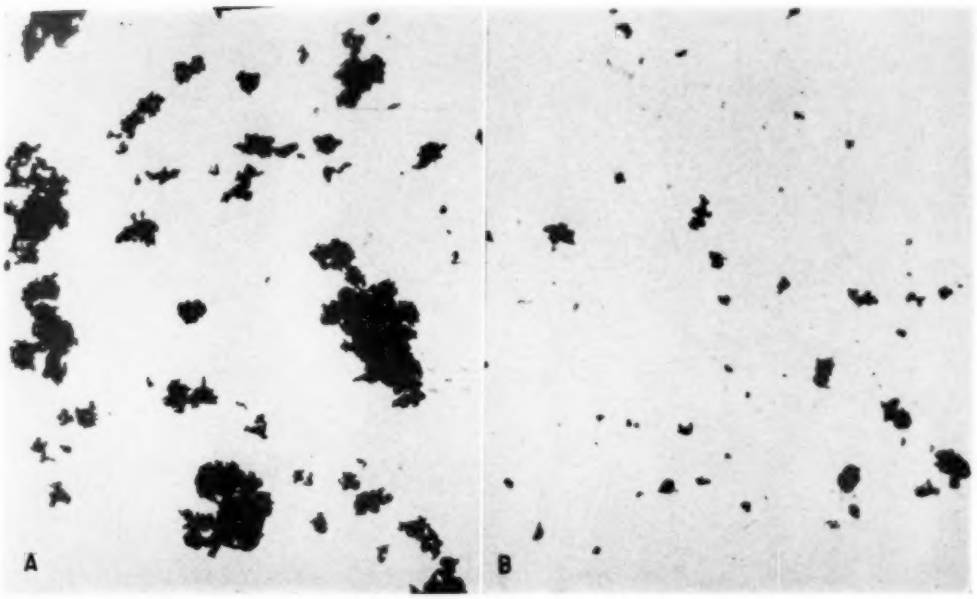

Fig. 1. A. Electron micrograph (magnified *c.* 2150 times) of a widely used commercial barium sulfate powder. B. Electron micrograph (magnified *c.* 2150 times) of the same product after micropulverization. This is a relatively crude micropowder.

ciently by wet grinding in a ball mill for several days (Fig. 3).

TOXICITY STUDIES

The advantages of using micropulverized radiopaque preparations in the x-ray examination of the gastro-intestinal tract are being investigated. This modification of a well established technic must be studied thoroughly, particularly in respect to any possible harmful features, since it is known that there is a correlation between toxicity and particle size (10–15). In general, the finer the particle size the greater the absorbability and toxicity. No immediate or delayed toxic reactions were encountered in ten rabbits following the intravenous injection of aqueous suspensions of barium sulfate in the dosage of 0.5 gm. per kilo of body weight.

Potential toxic properties of barium sulfate powders would probably relate only to the finest particles (0.04 to 0.1 micron), which by weight represent less than 0.0001 per cent of the total barium sulfate in suspension. Also it is unlikely that these insoluble particles can enter the blood stream directly from the gastro-intestinal tract, since it has been shown that insoluble particulate matter is absorbed primarily via the lymphatic system (16).

Because absorption from the large bowel is less than that from the upper gastro-intestinal tract, preliminary trials with the more finely divided barium suspension were restricted to barium enemas. No toxic reactions occurred in 60 examinations. Similar micropowders in the upper intestinal tract were used cautiously in small quantities (15 gm.). The amount of barium administered was increased progressively to 90 gm. No toxic manifestations occurred in 35 cases.

ROENTGENOGRAPHIC STUDIES

Crude micropowders produced by dry grinding (Fig. 1B) were used in the first five clinical studies. A typical post-evacuation barium enema roentgenogram is shown in Figure 2A. A standard barium sulfate suspension was used. Figure 2B demonstrates in the same patient the ap-

Fig. 2. A. Post-evacuation film of a normal colon, with a standard barium sulfate suspension. B. Post-evacuation film of same subject, with micropulverized barium. The mucosal detail is almost completely demonstrated from cecum to anus. Note the filiform appendiceal lumen.

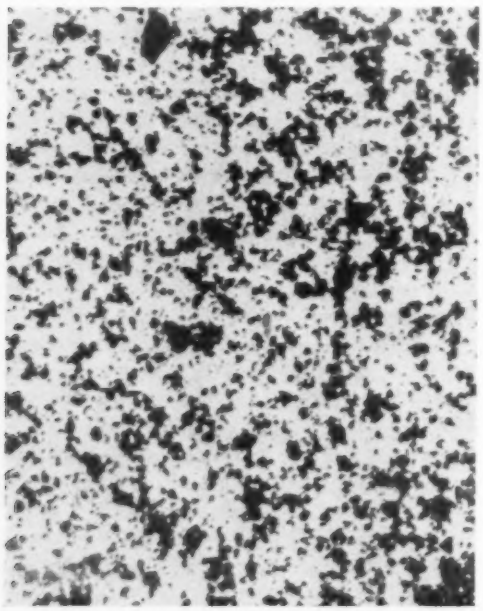

Fig. 3. Electron micrograph (magnified *c.* 2150 times) of barium sulfate micropulverized by wet grinding for sixty-four hours.

pearance of the normal mucosal surface of the colon, with the same technic but with micropulverized barium. The lumen of the appendix is well visualized in its entirety. Micropowders of a smaller particle size distribution, produced by the wet grinding process (Fig. 3), were used in 60 barium enemas. Figure 4 is a post-evacuation roentgenogram of a normal colon demonstrating greater mucosal adsorption of barium.

When 43 micropulverized barium enema roentgenograms were compared with regular barium sulfate films on the same cases, certain differences were observed:

1. In the post-evacuation films, less barium is retained in the lumen of the colon and more adheres to the mucosa.
2. The x-ray pattern simulates the anatomical mucosal topography frequently.
3. Larger areas of the colon are outlined. All of the large bowel mucosa was visualized in 7 of the 43 cases but in none examined with regular barium sulfate. At least two-thirds of the colon was

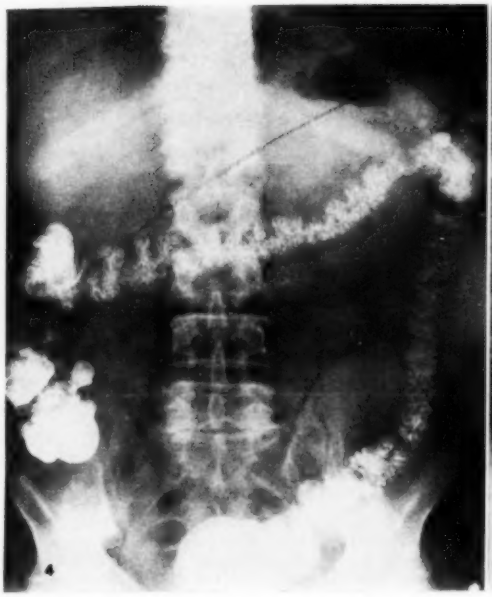

Fig. 4. Post-evacuation roentgenogram of a normal colon, demonstrating greater adherence of barium to the mucosa.

Fig. 5. Post-evacuation film. Cecal diverticula, appendix, and ileocecal junction are well outlined.

demonstrated in 36 cases, compared with 11 instances in the regular barium series.

4. The lumen of the appendix was filled in 26 of 29 patients with intact appendices; only 9 of 29 were visible in the routine roentgenograms.

Further evidence of the penetrability of these suspensions may be seen in Figure 5 in which several cecal diverticula, the appendix, and the appendicocecal and ileocecal junctions are clearly outlined. A micropowder barium enema was given to a patient with a ureterosigmoid anastomosis. The retrograde microbarium pyelogram is seen simultaneously with the filled colon, demonstrating the penetration of the suspension (Fig. 6). Subsequent examination, two days later, showed complete elimination of the barium from the urinary and gastro-intestinal tracts. Figure 7 is a roentgenogram of the stomach and upper part of the small bowel. The depression in the greater curvature of the stomach is due to an extrinsic mass. The mucosal

Fig. 6. A retrograde microbarium pyelogram can be seen simultaneously with the filled colon. A micropulverized barium enema was given to this patient with a ureterosigmoid anastomosis for carcinoma of the bladder. Patency of the ureter and colon was established.

Fig. 7. Roentgenogram of the stomach and upper intestinal tract, showing altered contour of the stomach due to an extrinsic mass and the mucosal detail in the duodenal cap and upper bowel.

topography of the duodenal cap is outlined clearly, and the pattern of the mucosa in the duodenum and part of the jejunum is visible.

DISCUSSION

The results of these preliminary investigations have shown that the particle size of powdered barium sulfate is of considerable importance when it is used as a radiopaque material. Also it is very likely that there is a critical range of particle size distribution which is optimal for specific radiologic procedures. Further studies are being conducted to clarify this possibility. The particle size distribution of barium sulfate powders could be standardized. This would permit roentgenologists to exchange data on the same basis regarding this important factor.

It is planned to investigate the use of dried micropulverized barium sulfate powder by insufflation through a gastroscope for the purpose of outlining ulcers, polyps, and tumors roentgenographically, and through a proctoscope to visualize the rectosigmoid area—a region which is difficult to outline with standard technics. Many other radiopaque substances may be similarly reduced in size for the purpose of improving the efficiency of radiologic technic with these materials.

CONCLUSIONS

The importance of particle size distribution in aqueous suspensions of barium sulfate used for x-ray examination of the gastro-intestinal tract has been demonstrated. The probable advantages to be attained from reducing the particle size of other radiopaque materials have been suggested. The potential toxic effects from the absorption of extremely fine barium sulfate particles, have been considered, but none were observed in 95 cases.

ACKNOWLEDGEMENTS: We are grateful to the following for their assistance: Leonard Baurmash, B.Ch.Eng., for determination of particle size and suggestions regarding pulverization procedures; R. F. Baker, Ph.D., for electron microscopy; James Hageman, for design and construction of the ball mill.

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The photographs of the roentgenograms were made by Thomas Masterson of the Photographic Section of the Birmingham Veterans Administration Hospital.

Birmingham Veterans Administration Hospital
Van Nuys, Calif.

REFERENCES

1. DRINKER, P., AND HATCH, T.: Industrial Dust: Hygienic Significance, Measurement and Control. New York, McGraw-Hill Book Co., Inc., 1936, Chapters I, III, and IV.

2. ARENS, R. A., AND MESIROW, S. D.: Gastric Mucosal Relief; Modified Sedimentation Method, Using Colloidally Suspended Barium Sulphate. Radiology **29:** 1–11, 1937.

3. WOLDMAN, E. E.: Barium Sulphate Suspension in Colloidal Aluminum Hydroxide: An Improved Contrast Medium for Roentgenographic Diagnosis of Gastrointestinal Lesions. Am. J. Roentgenol. **40:** 705–707, 1938.

4. HAMILTON, J. B.: Use of Tannic Acid in Barium Enemas. Am. J. Roentgenol. **56:** 101–103, 1946.

5. POPPEL, M. H., AND BERCOW, C.: Use of Modified Opaque Barium Sulfate Mixture in Roentgenography of Colon. Am. J. Roentgenol. **51:** 727–729, 1944.

6. ABEL, M. S.: A Barium-Gelatin Mixture for X-Ray Examination of the Digestive Tract. Radiology **43:** 175–180, 1944.

7. TAPLIN, G. V., BRYAN, F. A., BAURMASH, L., GREENE, W. W., HAYES, E., RALSTON, W., AND ADOLPH,

W.: Importance of Particle Size in Inhalation Therapy with Antibiotics. Am. Pharmaceut. Manufacturers Assoc., Western Section, Science Edition, Feb. 17, 1949.

8. VAN WIJK, A. M., AND PATTERSON, H. S.: Percentage of Particles of Different Sizes Removed from Dust-laden Air by Breathing. J. Indust. Hyg. & Toxicol. **22:** 31–35, 1940.

9. SIESHOLTZ, H. W., AND COHAN, L. H.: Calcium Carbonate Extender Pigments. Indust. & Engin. Chem. **41:** 217–436, 1949.

10. LOHSE, H. W.: Aeresols-dust, Smoke, Fogs, Clouds and Air Pollution as Problems Relating Science, Economics and Health. Can. Chem. Met. **21:** 340–342, 1937.

11. DRINKER, P., THOMSON, R. M., AND FINN, J. L.: Metal Fume Fever. Threshold Doses of Zinc Oxide, Preventive Measures, and Chronic Effects of Repeated Exposures. J. Indust. Hyg. **9:** 331–345, 1927.

12. WILSON, H. B., SYLVESTER, G. E., LASKIN, S., LABELLE, C. W., AND STOCKINGER, H. B.: Relation of Particle Size of Uranium Dioxide Dust to Toxicity Following Inhalation by Animals, Preliminary Report. J. Indust. Hyg. & Toxicol. **30:** 319–331, 1948.

13. SMITH, C. L.: Relation Between the Degree of Fineness of Pyrethrum Powder Produced by Different Periods of Grinding to Toxicity of Insects and the Deterioration by Light and Air. J. N.Y. Ent. Soc. **44:** 317–318, 1936.

14. ALEXANDER, P., KITCHENER, J. A., AND BRESCOE, H. V. A.: Inert Dust Insecticides. II. Nature of Effective Dusts. Ann. Applied Biol. **31:** 150–156, 1944.

15. BERAN, F.: Fruit Tree Carbolineum Emulsions. II. Particle Size and Insecticidal Action. Anz. Schädlengskunde. **13:** 1–3, 1937.

16. BEST, C. H., AND TAYLOR, N. B.: Physiological Basis of Medical Practice. Baltimore, Williams & Wilkins Co., 4th ed., 1945, pp. 81–82.

SUMARIO

Empleo del Sulfato de Bario Micropulverizado en el Diagnóstico Roentgenológico
Comunicación Preliminar

El sulfato de bario fué micropulverizado por trituración en seco o en húmedo en un molino de bolas de manera que se rebajara el número de partículas grandes (5 a 20 micras) y aumentara la concentración de las pequeñas (0.4 a 1.0 micra). Al comparar 43 estudios con enemas de bario pulverizado con las radiografías tomadas con el sulfato de bario corriente, observáronse algunas notables diferencias. Las radiografías consecutivas a la evacuación de la sustancia pulverizada revelaron menos bario en la luz del colon y más adherido a la mucosa, y el cuadro roentgenológico simuló frecuentemente la topografía anatómica de la mucosa. Con el bario micropulverizado distinguíanse zonas más grandes del colon: todo el intestino grueso en 7 casos y por lo menos dos terceras partes en 36 casos, comparado con 11 en la serie del bario corriente. La luz del apéndice se llenó en 26 de 29 enfermos con apéndices intactos, comparado con 9 de 29 cuando se usó el bario corriente.

Los potenciales efectos tóxicos debidos a la absorción de las finísimas partículas de sulfato de bario fueron tomados en cuenta, pero sin observarse ninguno en 95 casos.

EDITORIAL

Roentgen Diagnosis and Clinical Responsibility

Despite the extensive development of education, the art of communication is still relatively crude; many of the difficulties besetting mankind are the result of various interpretations accorded to the same words. In no field of human endeavor are clarity of language and uniformity of understanding more important than in medicine. This is especially true in the field of roentgen diagnosis, in which the communication of his findings by the radiologist to the referring physician should be clear and unequivocal. Yet roentgen diagnostic reports differ greatly both in form and language. They may vary from a simple negative or positive statement to a page of verbiage, descriptive and otherwise, often with no conclusion whatever.

The manner in which the report is made is not, however, simply a matter of form or custom. Too often the dogmatic statement or its antithesis, the discursive but inconclusive essay, is an expression of a point of view concerning the nature of roentgen diagnosis. There is an idea, widely held by clinicians, but frequently expressed by radiologists themselves, that a definitive diagnosis should rarely, if ever, be made from the roentgen examination. According to this theory, only a description of the findings, possibly interpreted in terms of gross pathology, is justified. In the minds of some physicians this idea stems from the feeling that the roentgenogram, after all, is merely a series of shadows; therefore, no specific pathology or etiology can be inferred from it. The radiologist, having arrogated to himself and his method a certain degree of omniscience, may be so chagrined at having overreached himself, by making a specific diagnosis which proved to be wrong, that he becomes overly cautious and is reluctant thereafter to make an etiologic diagnosis. The best illustration of this type of reaction lies in the diagnosis of pulmonary tuberculosis. Such a specific diagnosis, from the roentgen findings alone, will occasionally be in error, since various other inflammatory lesions and certain tumors may simulate the appearance of tuberculosis roentgenologically. No one would advocate making such a report without adequate safeguards, such as repeated studies to indicate the persistence of the lesion. But if the radiologist cannot make the diagnosis of pulmonary tuberculosis, who can? Must we always wait until tubercle bacilli are found in the sputum, and is such a finding invariably correct and invariably significant as to the disease from which the patient is suffering? Or, finally, must we always wait for the autopsy before a specific diagnosis is to be made?

The fact is that all diagnoses, regardless of their basis, even when derived from the gross and microscopic examination of tissues or of bacteria, are only probabilities. In some instances, the likelihood of error is very low, in others rather high, but rarely is the diagnosis absolute. The finding of tubercle bacilli in the sputum is frequently erroneous; furthermore, even though pathogenic bacilli are actually found, there is no certainty that they represent the disease from which the patient is suffering. Innumerable examples of similar character could be cited. Certainly errors will occur, but if we are to withhold a conclusion until complete certainty can be established, few diagnoses will be made premortem. It is possible to reduce this conception to an absurdity by citing the matter of stomach tumors.

Should a gastric carcinoma be so named by the radiologist or shall he merely designate it a tumor because on a rare occasion a sarcoma or a benign adenoma or a leiomyoma gave similar findings? In fact, why should the filling defect be called a tumor at all, since at times inflammatory masses and bezoars produce an exactly similar picture? We end by calling it a filling defect, a stultifying procedure which, if followed logically, would eventually make of the radiologist merely a high-class photographer.

What is really needed is a healthy skepticism on the part of the practitioner of medicine with regard to all diagnostic conclusions and a decent humility on the part of the diagnostician. But more important still is a knowledge of the possibilities and limitations of any diagnostic procedure in any particular condition or situation. Few will question the definitive diagnosis of a fracture of a long bone from the roentgenogram; many should question, and too often do not, the diagnosis of no fracture in the skull from roentgen examination. There are disease processes in which competent roentgen technic and interpretation should result in a definitive diagnosis with an error of no more than 5 per cent. There are others in which a conclusive diagnosis can scarcely ever be made with any probability of accuracy.

It is said that the labeling of a patient by the radiologist with a specific diagnosis such as tuberculosis or duodenal ulcer is so compelling that it should rarely be done. But similar reasoning applied to heart disease, for example, would mean that a diagnosis of mitral stenosis would rarely be made because it often condemns the patient to invalidism and is largely dependent upon a rumble heard by the cardiologist. And the diagnosis of syphilis, together with its specific therapy, might be withheld because the physical signs and serological tests are not uniformly reliable. It is true that errors have been made in both of these fields, but these result largely from poor technic and faulty judgment. There is certainly nothing wrong with a definitive diagnosis of heart disease or of syphilis, if properly safeguarded.

The long-winded roentgen diagnostic report, dilating upon each physiological phenomenon and each anatomical peculiarity without arriving at any clinical conclusions, is of little value and too often represents an evasion of clinical responsibility. On the other hand, a simple positive dogmatic statement without explanation carries with it a connotation of infallibility which is unjustified. While the report should be intended primarily to inform the physician as to the diagnosis of his patient's condition, it is also important to clarify for him some of the features of the disease. A descriptive statement followed by a conclusion or opinion which in certain situations offers a specific diagnosis, and in others indicates a choice of several diagnoses in the order of their probability, represents the most useful approach. In some cases we must limit the specificity of the diagnosis because of the limitations of the method. In others, we should not hesitate to declare unequivocally that we cannot make any specific diagnosis at all. We must expect to err occasionally; our errors should instruct us, not dismay us. We should think first of the welfare of the patient, last of our own ego or security.

Every radiologist should assume clinical responsibility for the welfare of the patient referred to him. He should hesitate long before shifting any of it, whether it be further examination or further diagnosis, to the referring physician or to another specialist. Such responsibility makes it incumbent upon the radiologist to offer a definitive diagnosis whenever there is a reasonable probability that it will be correct.

LEO G. RIGLER, M.D.

ANNOUNCEMENTS AND BOOK REVIEWS

CLEVELAND RADIOLOGICAL SOCIETY

The newly elected officers of the Cleveland Radiological Society are Dr. George R. Krause, President, and Dr. John R. Hannan (10515 Carnegie Ave., Cleveland 6), Secretary-Treasurer. The meetings of the Society are held at 6:45 P.M. on the fourth Monday of each month, from October to April.

GEORGIA RADIOLOGICAL SOCIETY

At the annual meeting of the Georgia Radiological Society held in Macon on April 19, the following officers were elected: President, Dr. J. J. Collins, of Thomasville; Vice-President, Dr. M. M. Mass, of Macon; Secretary, Dr. R. C. Pendergrass, of Americus. Dr. J. J. Clark, of Atlanta, was named Counselor to the American College of Radiology.

The guest speaker at the meeting was Dr. J. Maxey Dell, of Gainesville, Fla., who took as his subject "The Necessity of a Radiologist Being a Good Clinician."

MINNESOTA RADIOLOGICAL SOCIETY

The winter meeting of the Minnesota Radiological Society was held on March 25, in Rochester. The speakers included Dr. J. W. Beeler, Dr. R. L. Tondreau, Dr. B. R. Kirklin, Dr. A. Bruwer, Dr. C. A. Good, Dr. D. S. Childs, Jr., and Dr. H. H. Young. Dr. D. G. Pugh conducted a demonstration of the angiocardiographic unit at Colonial Hospital. A business session and dinner followed the scientific assembly.

TENNESSEE RADIOLOGICAL SOCIETY

At the annual meeting of the Tennessee Radiological Society, held on April 12 at the Hotel Peabody, Memphis, the following officers were elected for the ensuing year: Dr. Walter W. Robinson, of Memphis, President; Dr. Walter D. Hankins, of Johnson City, Vice-President; Dr. J. Marsh Frère, Newell Hospital, Chattanooga 2, Secretary-Treasurer.

Dr. Wm. B. Seaman, of St. Louis, was the guest speaker.

SOCIEDAD RADIOLÓGICA PANAMENA

At a recent meeting of radiologists in Panama City, the Sociedad Radiológica Panameña was organized, a constitution and by-laws were approved, and the following officers were elected: President, J. J. Vallarino, M.D.; Vice-President, Ernesto Zubieta, M.D.; Treasurer, Roberto Sandoval, M.D.; Secretary and Editor, Luis Arrieta Sánchez, M.D., Apartado No. 86, Panama, Republic of Panama.

FELLOWSHIP IN PEDIATRIC ROENTGENOLOGY

Dr. Donald K. Bailey, Cincinnati, has been awarded the recently established Fellowship in Pediatric Roentgenology in the Department of Radiology of the University of Cincinnati College of Medicine. The fellowship will be awarded annually for a term of one year by the Department of Radiology for study in the Department of Roentgenology of the Children's Hospital of Cincinnati.

POSTGRADUATE COURSE DIAGNOSIS AND THERAPY OF CANCER

A course on the Diagnosis and Therapy of Cancer, including Clinical Surgery, Radiation Therapy, and Endocrine Therapy, will be conducted under the auspices of University Extension and the School of Medicine of the University of California, from July 17 to 22, 1950, at the Veterans Administration Center, Los Angeles. The course is open to graduates of medical schools approved by the Council on Medical Education and Hospitals of the American Medical Association. The fee is $100.00, payable on enrollment. Applications and requests for information should be addressed to Office of Medical Extension, University Extension, University of California, Los Angeles 24, Calif.

Books Received

CANCER. A MANUAL FOR PRACTITIONERS. A volume of 308 pages. Committee on Publication: Ernest M. Daland, M.D., Chairman; Sidney Farber, M.D.; George W. Holmes, M.D.; Channing C. Simmons, M.D., Editor; Merrill C. Sosman, M.D.; and Shields Warren, M.D. Published by the American Cancer Society (Massachusetts Division), Inc., 462 Boylston St., Boston 16, Mass., 2nd ed., 1950.

INFRARED RADIATION THERAPY SOURCES AND THEIR ANALYSIS WITH SCANNER. By LEOPOLD ROVNER, Consulting Physicist, Cambridge, Mass. Publication No. 65, American Lecture Series. A Monograph in American Lectures in Medical Physics, edited by Otto Glasser, Ph.D., Department of Biophysics, Cleveland Clinic Foundation, Cleveland, Ohio. A volume of 34 pages, with 21 illustrations. Published by Charles C Thomas, Springfield, Ill., 1950. Price $1.50.

KLINISCHE PATHOLOGIE DER BLUTKRANKHEITEN, By PROF. DR. RUDOLF SCHOEN AND PROF. DR. WALTER TISCHENDORF, of the Medical University Clinic at Göttingen. A volume of 522 pages, with 101 illustrations. Published by Georg

Thieme, Stuttgart, 1950. Agents for United States, Grune & Stratton, Inc., New York.

LEHRBUCH DER RÖNTGENDIAGNOSTIK. By H. R. SCHINZ, W. E. BAENSCH, E. FRIEDL, E. UEHLINGER, with contributions by E. Brandenberger, A. Brunner, U. Cocchi, N. P. G. Edling, J. Eggert, F. K. Fischer, M. Holzmann, H. Krayenbühl, Å. Lindbom, E. Lindgren, G. A. Preiss, S. Welin, and A. Zuppinger. Volume I. The Skeletal System. Part I. A volume of 426 pages, with 507 illustrations. Published by Georg Thieme, Stuttgart, 5th (completely revised) edition, 1950. Agents for United States, Grune & Stratton, Inc., New York.

UNTERSUCHUNGEN ÜBER DIE TUBERKULOSE DES DÜNNDARMES. By Dr. F. BÖHM, Heilstätte Überruh b. Isny/Allgäu. A volume of 71 pages, with 68 illustrations. Published by Georg Thieme, Stuttgart, 1950. Agents for the United States, Grune & Stratton, New York.

Book Reviews

CARCINOMA OF THE LARYNX. By F. BACLESSE, M.D., "Chef de Service" of the X-ray Department, Fondation Curie, Paris, with A Statistical Report on Cases Treated with X-Rays Only, by R. W. GUNDERSON, B.Sc., D.M.R.T., F.R.C.S. (Eng.), The Meyerstein Institute of Radiotherapy, The Middlesex Hospital, London, W.1. Brit. J. Radiol., Supplement No. 3. A monograph of 68 pages, with 97 figures and 19 tables. Published by the British Institute of Radiology, 32 Welbeck St., London, W.1., 1949. Price 25s. (post free).

This monograph, appearing as a Supplement to the *British Journal of Radiology*, is a report of observations and practices of the X-ray Department of the Fondation Curie, Paris, and is not concerned with methods and statistics of other institutions. Its purpose, as stated in the preface, is: "(1) to show the importance of clinical and radiological examination with respect both to prognosis and interpretation of the results; (2) to discuss the various methods of x-ray therapy of the larynx in the light of the five-year survival figures."

Two-thirds of the monograph deals with the importance of establishing the nature of the lesion, as to site, size, and spread, by laryngoscopic and particularly by radiographic technics, as an essential for therapy and prognosis. The text is brief but is copiously illustrated with drawings, sketches, roentgenograms, and laryngoscopic views which demonstrate beautifully the gross characteristics of laryngeal carcinoma.

The treatment technic is described in detail: biologic response serves to guide the therapy, in the main, and fibrinous reactions in the hypopharynx are avoided, at least on the posterior wall. Slight fibrinous reactions in the larynx may occur. Acute edema is prevented by relatively slow therapy. "Tracheotomy as an emergency," says the author, "is almost unknown among our cases today." On the skin, dry desquamation is the end-point as a general rule, though moist desquamation is permitted in local areas. Baclesse states that daily therapy tends to produce moist desquamation "at regular fortnightly intervals with only two to three days variation." Beginning at four weeks and at every two weeks thereafter, a critical point arrives. "To avoid severe skin reactions, it is essential not to exceed a given dose for a given time—4, 6, 8, 10, or 12 weeks." A table of dose in relation to time is given. For a 6 × 8-cm. field, a skin dose of 4,000 r is permitted in six weeks, or 8,000 r in twelve weeks. Six weeks for a small field is the minimum period now employed. Large and/or radioresistant lesions require eight to twelve weeks of therapy.

The kilovoltage used is 180 to 250 kv., with 1 mm. Cu filtration; no advantage is conceded for heavier filtration. The focal skin distance is 50 to 60 cm. The low dosage rate advocated by Coutard has been abandoned in favor of 15 to 20 r per minute. Field size, daily dose, number of fields, reduction in field size during treatment, and total duration of treatment are individually determined.

In summarizing, the author re-emphasizes the ready curability of small localized lesions with 6,000 to 7,000 r to the skin (3,000 to 3,500 r per field) in six weeks and the necessity of 8,000 to 12,000 r for two to three months for large growths and those with node metastases.

An appendix to the monograph discusses critically the relationship of biologic reaction and prognosis, as observed in Baclesse's series, and concludes that the prognosis is better and that less cartilage necrosis is seen when fibrinous reactions are avoided.

RADIOGRAPHIC ATLAS OF SKELETAL DEVELOPMENT OF THE HAND AND WRIST. By WALTER W. GREULICH, M.A., Ph.D., Professor of Anatomy, Stanford University School of Medicine, formerly Professor of Physical Anthropology and Anatomy and Director of the Brush Foundation, Western Reserve University School of Medicine, and S. IDELL PYLE, M.S., Research Associate, Brush Foundation, and Department of Anatomy, Western Reserve University School of Medicine. A volume of 190 pages, with 60 reproductions, 5 graphs, 2 tables, and 182 line drawings. Published by the Stanford University Press, Stanford, Calif., 1950. Price $10.00.

Here is a book which compiles the most reliable data on bone age in an extremely useful form, so that it is available to the practising clinician, pediatrician, internist, or radiologist, quickly and easily. The impression derived after reading the introductory portions, and studying particularly the brief remarks on maturity indicators, and appraising the methods of illustrating these, is that with the aid of

this work one can accurately estimate the bone age and obtain an appreciation of its interpretation.

A tremendous amount of work has been done, with over 1,000 individuals with from 2 to 20 films each, in an effort to find an acceptable series of standards. There is no skipping or disappearance of epiphyses. The book is the result of the work initiated by T. Wingate Todd, whose *Atlas of Skeletal Maturation* has been the bible of those interested in bone age since 1937. This newer work represents an improvement in the illustrations and a uniformity of material not to be found previously. Other things, which add to its value are the concise introduction on the interpretations of skeletal development and bone age as known to the clinician and radiologist, and the numerous line sketches of the maturity indicators for the individual bones of the wrist and hand. These exemplify the care with which the book was developed and the close attention to detail. The line drawings bring out the minute points, creating a much greater feeling of security in the interpretation of a single film as an indicator for bone age.

This Atlas should be in the possession of all those who expect to interpret skeletal age from films or assay the patient from a clinical point of view.

DAS MENSCHLICHE KNOCHENMARK [THE HUMAN BONE MARROW]. By KARL ROHR, Professor of Medicine, University of Zürich, Zürich, Switzerland. A volume of 404 pages, with 143 illustrations. Published by Georg Thieme, Stuttgart, Germany, 2nd ed., 1949.

The appearance of a new edition of this comprehensive work upon the marrow in man should be welcomed by all students of the human bone marrow. The first edition was published in 1940, in ill-starred Leipzig. Only a few in this country were fortunate enough to have access to a copy of this Swiss text in the years intervening until the publication of the second edition. Such basic problems as embryologic hematopoiesis, circulation of the marrow, and individual cytology of the developing blood cells receive ample discussion and illustration. The terminology is classical and for the most part will be readily understood by English-speaking students of this subject.

The most important but not unique contribution of this work is the emphasis which the author from the beginning places upon the reticulum cell or mesenchymal cell of the blood-forming tissues as the mother cell for all the blasts and blood cells. This approach to an understanding of the diseases of the blood-forming organs will be of particular value to students of diseases of the bone itself, whether the particular field of investigation lies in radiology, pathology, or orthopedic surgery, for the author carefully delineates the derivation of plasma cells, fat cells, tissue mast cells, macrophages, fibrocytes, osteoblasts, and osteoclasts from the reticulum cells. The cytology of all these cells is amply portrayed in aspirate preparations, and its understanding is a contribution to this borderline field, where bone tumors and neoplasia of the blood-forming tissues intermingle.

An entire section is devoted to a study of blood cell mitoses, and tables of mitotic indices are included. Postmortem blood cellular changes are dynamically presented. All of the major hematologic dyscrasias and a surprising number of the more unusual ones are duly discussed.

The illustrations consist of numerous well colored drawings, as well as clear-cut black and white photomicrographs of individual cells from marrow aspirates. Where appropriate, marrow sections are likewise depicted.

The derivation of the plasma cells from reticulum cells is particularly well handled and should be of especial value to those studying the reticulo-endothelial system and its structural relation to antibody formation. Yet in relation to this latter subject, one notes that relatively little of the vast current literature on hormonal relationship to hematopoiesis and hematophysiology has as yet found its way into this monograph. Also lacking is an adequate discussion of irradiation effects upon the marrow and its supporting structures, although much of the later material was probably not available to the author. As if in compensation, however, the work affords an entree into the Central European hematologic literature of the war years, a literature which is still not readily accessible in English-speaking countries.

Thirty-five pages of bibliography attest to the present importance of the bone-marrow aspirate in clinical diagnosis and research.

ANNUAL REPORT ON THE RESULTS OF RADIOTHERAPY IN CANCER OF THE UTERINE CERVIX. FIFTH VOLUME. STATEMENTS OF RESULTS OBTAINED IN 1941 AND PREVIOUS YEARS (collated in 1948). Sponsored by The British Empire Cancer Campaign, London; The Donner Foundation, Philadelphia; The Cancerföreningen, Stockholm; and The World Health Organization. Editorial Committee: DR. J. HEYMAN (Editor), Stockholm; DR. M. DONALDSON, London; Dr. L. C. SCHEFFEY, Philadelphia. A volume of 245 pages. Published by P. A. Norstedt & Söner, Stockholm, 1949.

This report, prepared under the editorial direction of J. Heyman (Stockholm), M. Donaldson (London), and L. C. Scheffey (Philadelphia), is the fifth in a series originally sponsored by the League of Nations.

Treatment results (five-year and longer survivals) are presented for twenty-four radiotherapy centers in seven European countries and the United States. A brief commentary by the editors cautions against casual comparison of the statistics. Voluntary selection of patients in some instances and absence of selection in others, along with differences in applying the rules of staging, preclude simple comparison.

The over-all report covers the results in 30,000 patients.

RADIOLOGICAL SOCIETIES: SECRETARIES AND MEETING DATES

Editor's Note: Secretaries of state and local radiological societies are requested to co-operate in keeping this section up-to-date by notifying the editor promptly of changes in officers and meeting dates.

RADIOLOGICAL SOCIETY OF NORTH AMERICA. *Secretary-Treasurer,* Donald S. Childs, M.D., 713 E. Genesee St., Syracuse 2, N. Y.

AMERICAN RADIUM SOCIETY. *Secretary,* Hugh F. Hare, M.D., 605 Commonwealth Ave., Boston 15, Mass.

AMERICAN ROENTGEN RAY SOCIETY. *Secretary,* Barton R. Young, M.D., Philadelphia, Penna.

AMERICAN COLLEGE OF RADIOLOGY. *Secretary,* William C. Stronach, 20 N. Wacker Dr., Chicago 6, Ill.

SECTION ON RADIOLOGY, A. M. A. *Secretary,* Paul C. Hodges, M.D., 950 East 59th St., Chicago 37, Ill.

Alabama

ALABAMA RADIOLOGICAL SOCIETY. *Secretary-Treasurer,* W. D. Anderson, M.D., 420 10th St., Tuscaloosa.

Arizona

ARIZONA ASSOCIATION OF PATHOLOGISTS AND RADIOLOGISTS. *Secretary,* R. Lee Foster, M.D., 507 Professional Bldg., Phoenix.

Arkansas

ARKANSAS RADIOLOGICAL SOCIETY. *Secretary,* Fred Hames, M.D., Pine Bluff. Meets every three months and at meeting of State Medical Society.

California

CALIFORNIA MEDICAL ASSOCIATION, SECTION ON RADIOLOGY. *Secretary,* Sydney F. Thomas, M.D., Palo Alto Clinic, Palo Alto.

EAST BAY ROENTGEN SOCIETY. *Secretary,* Dan Tucker, M.D., 434 30th St., Oakland 9. Meets monthly, first Thursday, at Peralta Hospital.

LOS ANGELES RADIOLOGICAL SOCIETY. *Secretary,* Harold P. Tompkins, M. D., 658 South Westlake Ave. Meets monthly, second Wednesday, County Society Bldg.

NORTHERN CALIFORNIA RADIOLOGICAL CLUB. *Secretary,* Robert L. Ayers, M.D., 726 4th St., Marysville. Meets at dinner last Monday of September, November, January, March, and May.

PACIFIC ROENTGEN SOCIETY. *Secretary,* L. Henry Garland, M.D., 450 Sutter St., San Francisco 8. Meets annually with State Medical Association.

SAN DIEGO ROENTGEN SOCIETY. *Secretary,* R. F. Niehaus, M.D., 1831 Fourth Ave., San Diego. Meets first Wednesday of each month.

X-RAY STUDY CLUB OF SAN FRANCISCO. *Secretary,* Merrell A. Sisson, M.D., 450 Sutter St., San Francisco 8. Meets third Thursday at 7:45, January to June at Stanford University Hospital, July to December at San Francisco Hospital.

Colorado

COLORADO RADIOLOGICAL SOCIETY. *Secretary,* Paul E. RePass, M.D., 306 Republic Bldg., Denver 2. Meets monthly, third Friday, at University of Colorado Medical Center or Denver Athletic Club.

Connecticut

CONNECTICUT STATE MEDICAL SOCIETY, SECTION ON RADIOLOGY. *Secretary,* Fred Zaff, M.D., 135 Whitney Ave., New Haven. Meetings bimonthly, second Wednesday.

CONNECTICUT VALLEY RADIOLOGICAL SOCIETY. *Secretary,* Ellwood W. Godfrey, M.D., 1676 Boulevard, W. Hartford. Meets second Friday of October and April.

District of Columbia

RADIOLOGICAL SECTION, DISTRICT OF COLUMBIA MEDICAL SOCIETY. *Secretary,* Karl C. Corley, M.D., 1835 Eye St., N.W., Washington 6. Meets third Thursday, January, March, May, and October, at 8:00 P.M., in Medical Society Auditorium.

Florida

FLORIDA RADIOLOGICAL SOCIETY. *Secretary-Treasurer,* John J. McGuire, M.D., 1117 N. Palafox, Pensacola. Meets in April and in November.

GREATER MIAMI RADIOLOGICAL SOCIETY. *Secretary,* David Kirsh, M.D., 712 duPont Bldg., Miami 32. Meets monthly, last Wednesday, 8:00 P.M.

Georgia

ATLANTA RADIOLOGICAL SOCIETY. *Secretary-Treasurer,* Ted F. Leigh, M.D., Emory University Hospital. Meets second Friday, September to May.

GEORGIA RADIOLOGICAL SOCIETY. *Secretary-Treasurer,* Robert C. Pendergrass, M.D., Americus. Meets in November and at the annual meeting of State Medical Association.

Illinois

CHICAGO ROENTGEN SOCIETY, *Secretary,* John H. Gilmore, M.D., 720 N. Michigan Ave., Chicago 11. Meets at the University Club, second Thursday of October, November, January, February, March, and April at 8:00 P.M.

ILLINOIS RADIOLOGICAL SOCIETY. *Secretary-Treasurer,* William DeHollander, M.D., St. Johns' Hospital, Springfield. Meetings quarterly as announced.

ILLINOIS STATE MEDICAL SOCIETY, SECTION ON RADIOLOGY. *Secretary,* Harold L. Shinall, M.D., St. Joseph's Hospital, Bloomington.

Indiana

INDIANA ROENTGEN SOCIETY. *Secretary-Treasurer,* William M. Loehr, M.D., 712 Hume-Mansur Bldg., Indianapolis 4. Annual meeting in May.

Iowa

IOWA X-RAY CLUB. *Secretary,* Arthur W. Erskine, M.D., 326 Higley Building, Cedar Rapids. Meets during annual session of State Medical Society.

Kansas

KANSAS RADIOLOGICAL SOCIETY. *Secretary*, Anthony F. Rossitto, M.D., Wichita Hospital, Wichita. Meets annually with State Medical Society.

Kentucky

LOUISVILLE RADIOLOGICAL SOCIETY, *Secretary*, Everett L. Pirkey, M.D., Louisville General Hospital. Meets monthly, second Friday, at Seelbach Hotel.

Louisiana

LOUISIANA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Johnson R. Anderson, M.D., No. Louisiana Sanitarium, Shreveport. Meets with State Medical Society.

ORLEANS PARISH RADIOLOGICAL SOCIETY. *Secretary*, Joseph V. Schlosser, M.D., Charity Hospital of Louisiana, New Orleans 13. Meets first Tuesday of each month.

SHREVEPORT RADIOLOGICAL CLUB. *Secretary*, Oscar O. Jones, M.D., 2622 Greenwood Road. Meets monthly September to May, third Wednesday.

Maryland

BALTIMORE CITY MEDICAL SOCIETY, RADIOLOGICAL SECTION. *Secretary*, J. Howard Franz, M.D., 1127 St. Paul St., Baltimore 2.

Michigan

DETROIT X-RAY AND RADIUM SOCIETY. *Secretary*, George Belanger, M.D., Harper Hospital, Detroit 1. Meetings first Thursday, October to May, at Wayne County Medical Society club rooms.

MICHIGAN ASSOCIATION OF ROENTGENOLOGISTS. *Secretary-Treasurer*, R. B. MacDuff, M.D., 220 Genesee Bank Building, Flint 3.

Minnesota

MINNESOTA RADIOLOGICAL SOCIETY. *Secretary*, Leo A. Nash, M.D., 572 Lowry Medical Arts Bldg., St. Paul 2. Meets in Spring and Fall.

Missouri

RADIOLOGICAL SOCIETY OF GREATER KANSAS CITY. *Secretary*, Wm. M. Kitchen, M.D., 1010 Rialto Building, Kansas City 6, Mo. Meetings last Friday of each month.

ST. LOUIS SOCIETY OF RADIOLOGISTS. *Secretary*, H. R. Senturia, M.D., Pasteur Medical Bldg. Meets on fourth Wednesday, October to May.

Nebraska

NEBRASKA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, John E. Downing, M.D., 816 Medical Arts Bldg., Omaha. Meets fourth Thursday of each month at 6 P.M. in Omaha or Lincoln.

New England

NEW ENGLAND ROENTGEN RAY SOCIETY. *Secretary-Treasurer*, George Levene, M.D., Massachusetts Memorial Hospitals, Boston. Meets monthly on third Friday at the Harvard Club.

New Hampshire

NEW HAMPSHIRE ROENTGEN SOCIETY. *Secretary*, Albert C. Johnston, M.D., Elliot Community Hospital, Keene. Meetings quarterly in Concord.

New Jersey

RADIOLOGICAL SOCIETY OF NEW JERSEY. *Secretary*, Benjamin Copleman, M.D., 280 Hobart St., Perth Amboy. Meets at Atlantic City at time of State Medical Society and midwinter in Elizabeth.

New York

ASSOCIATED RADIOLOGISTS OF NEW YORK, INC. *Secretary*, William J. Francis, M.D., East Rockaway.

BROOKLYN ROENTGEN RAY SOCIETY. *Secretary*, J. Daversa, M.D., 603 Fourth Ave., Brooklyn. Meets fourth Tuesday, October to April.

BUFFALO RADIOLOGICAL SOCIETY. *Secretary-Treasurer*. Mario C. Gian, M.D., 610 Niagara St., Buffalo 1. Meetings second Monday, October to May.

CENTRAL NEW YORK ROENTGEN SOCIETY. *Secretary*, Dwight V. Needham, M.D., 608 E. Genesee St., Syracuse 10. Meetings January, May, October.

KINGS COUNTY RADIOLOGICAL SOCIETY. *Secretary*, Marcus Wiener, M.D., 1430 48th St., Brooklyn 19. Meetings fourth Thursday evening, October to May, at 8:45 P.M., in Kings County Medical Bldg.

NEW YORK ROENTGEN SOCIETY. *Secretary*, F. H. Ghiselin, M.D., 111 E. 76 St., New York.

QUEENS ROENTGEN RAY SOCIETY. *Secretary*, Jacob E. Goldstein, M.D., 88-29 163rd St., Jamaica 3. Meets fourth Monday of each month.

ROCHESTER ROENTGEN-RAY SOCIETY. *Secretary-Treasurer*, A. Vaughn Winchell, M.D., 40 Meigs St. Meets at Strong Memorial Hospital, last Monday of each month, September through May.

North Carolina

RADIOLOGICAL SOCIETY OF NORTH CAROLINA. *Secretary*, James E. Hemphill, M.D , Professional Bldg., Charlotte 2. Meets in May and October.

North Dakota

NORTH DAKOTA RADIOLOGICAL SOCIETY. *Secretary*, Charles Heilman, M.D., 807 Broadway, Fargo.

Ohio

OHIO STATE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Edward C. Elsey, M.D., 927 Carew Tower, Cincinnati 2. Meets with State Medical Association.

CENTRAL OHIO RADIOLOGICAL SOCIETY. *Secretary*, Paul D. Meyer, M.D., Grant Hospital, Columbus. Meets second Thursday, October, December, February, April, and June, 6:30 P.M., Seneca Hotel, Columbus.

CINCINNATI RADIOLOGICAL SOCIETY. *Secretary*, E. C. Elsey, M.D. Meets last Monday, September to May.

CLEVELAND RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, John R. Hannan, M.D., 10515 Carnegie Ave., Cleveland 6. Meetings at 6:45 P.M. on fourth Monday, October to April, inclusive.

MIAMI VALLEY RADIOLOGICAL SOCIETY. *Secretary*, Geo. A. Nicoll, M.D., Miami Valley Hospital, Dayton. Meets monthly, second Friday.

Oklahoma

OKLAHOMA STATE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, W. E. Brown, M.D., 21st and Xanthus, Tulsa 4. Meets in October, January, and May.

Oregon

OREGON RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Selma Hyman, M.D., University of Oregon Medical School, Portland. Meets monthly, on the second Wednesday, at 8:00 P.M., in the library of the University of Oregon Medical School.

Pacific Northwest

PACIFIC NORTHWEST RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Sydney J. Hawley, M.D., 1320 Madison St., Seattle 4. Meets annually in May.

Pennsylvania

PENNSYLVANIA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, James M. Converse, M.D., 416 Pine St., Williamsport 8. Meets annually.

PHILADELPHIA ROENTGEN RAY SOCIETY. *Secretary*, George P. Keefer, M.D., 1930 Chestnut St., Philadelphia 9. Meets first Thursday of each month at 8:00 P.M., from October to May, in Thomson Hall, College of Physicians, 21 S. 22nd St.

PITTSBURGH ROENTGEN SOCIETY. *Secretary-Treasurer*, Edwin J. Euphrat, M.D., 3500 Fifth Ave., Pittsburgh 13. Meets monthly, second Wednesday, at 6:30 P.M., October to May, at Webster Hall.

Rocky Mountain States

ROCKY MOUNTAIN RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Maurice D. Frazer, M.D., Lincoln Clinic, Lincoln, Nebr.

South Carolina

SOUTH CAROLINA X-RAY SOCIETY. *Secretary-Treasurer*, Robert B. Taft, M.D., 103 Rutledge Ave., Charleston 16.

South Dakota

RADIOLOGICAL SOCIETY OF SOUTH DAKOTA. *Secretary-Treasurer*, Marianne Wallis, M.D., 1200 E. Fifth Ave., Mitchell. Meets with State Medical Society.

Tennessee

MEMPHIS ROENTGEN CLUB. Meetings second Tuesday of each month at University Center.

TENNESSEE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, J. Marsh Frère, M.D., 707 Walnut St., Chattanooga. Meets annually with State Medical Society in April.

Texas

DALLAS-FORT WORTH ROENTGEN STUDY CLUB. *Secretary*, X. R. Hyde, M.D., Medical Arts Bldg., Fort Worth 2. Meets monthly, third Monday, in Dallas odd months, Fort Worth even months.

HOUSTON X-RAY CLUB. *Secretary*, Curtis H. Burge, M.D., 3020 San Jacinto, Houston 4. Meetings fourth Monday of each month.

TEXAS RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, R. P. O'Bannon, M.D., 650 Fifth Ave., Fort Worth Next meeting, Jan. 19-20, 1951, in Galveston.

Utah

UTAH STATE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Angus K. Wilson, M.D., 343 S. Main St., Salt Lake City. Meets third Wednesday, January, March, May, September, November.

Virginia

VIRGINIA RADIOLOGICAL SOCIETY. *Secretary*, P. B. Parsons, M.D., Norfolk General Hospital, Norfolk.

Washington

WASHINGTON STATE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, John H. Walker, M.D., 1115 Terry Ave., Seattle. Meetings fourth Monday, October through May, at College Club, Seattle.

Wisconsin

MILWAUKEE ROENTGEN RAY SOCIETY. *Secretary-Treasurer*, Theodore J. Pfeffer, M.D., 839 N. Marshall St., Milwaukee 2. Meets monthly on second Monday at the University Club.

RADIOLOGICAL SECTION OF THE WISCONSIN STATE MEDICAL SOCIETY. *Secretary*, Abraham Melamed, M.D., 425 E. Wisconsin Ave., Milwaukee. Meets in May and with State Medical Society, September.

UNIVERSITY OF WISCONSIN RADIOLOGICAL CONFERENCE. Meets first and third Thursdays 4 P.M., September to May, Service Memorial Institute, Madison 6.

WISCONSIN RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Irving I. Cowan, M.D., 425 East Wisconsin Ave., Milwaukee 2.

Puerto Rico

ASOCIACIÓN PUERTORRIQUEÑA DE RADIOLOGÍA. *Secretary*, Jesús Rivera Otero, M.D., Box 3542, Santurce, Puerto Rico.

CANADA

CANADIAN ASSOCIATION OF RADIOLOGISTS. *Honorary Secretary-Treasurer*, E. M. Crawford, M.D. Associate Honorary Secretary-Treasurer, Jean Bouchard, M.D. *Central Office*, 1535 Sherbrooke St., West, Montreal 26, Quebec. Meetings in January and June.

LA SOCIÉTÉ CANADIENNE-FRANÇAISE D'ELECTROLOGIE ET DE RADIOLOGIE MÉDICALES. *General Secretary*, Origéne Dufresne, M.D., Institut du Radium, Montreal. Meets third Saturday each month.

CUBA

SOCIEDAD DE RADIOLOGÍA Y FISIOTERAPIA DE CUBA. Offices in Hospital Mercedes, Havana. Meets monthly.

MEXICO

SOCIEDAD MEXICANA DE RADIOLOGÍA Y FISIOTERAPIA. *General Secretary*, Dr. Dionisio Pérez Cosío, Marsella 11, México, D. F. Meetings first Monday of each month.

PANAMA

SOCIEDAD RADIOLÓGICA PANAMEÑA. *Secretary-Editor*, Luis Arrieta Sánchez, M.D., Apartado No. 86, Panama, R. de P.

ABSTRACTS OF CURRENT LITERATURE

ROENTGEN DIAGNOSIS

The Head and Neck

FRENCH, LYLE A., AND BLAKE, PAUL S. Cerebral Angiography 895

SJÖQVIST, OLOF, ET AL. Diagnosis of Intracerebral Hematomas Following Frontal Lobotomy 895

JUPE, M. H., RUSSELL, DOROTHY S., HUGHES, BRODIE. Cerebral Tumours 896

WOLFE, H. R. I., AND FRANCE, N. E. Arteriovenous Aneurysm of the Great Vein of Galen. 896

ROBERTSON, E. GRAEME. Pulsating Exophthalmos Due to Defective Development of the Sphenoid Bone 897

DE VET, A. C. Caries Cranii (Tuberculosis of the Flat Bones of the Vault of the Skull) 897

GALARZA, MAX ESPINOZA. Tomography of Larynx in Disseminated Pulmonary Tuberculosis 897

The Chest

FLEISCHNER, FELIX G. Bronchial Peristalsis 897

DIAZ, ARQUIMEDES RAMOS. Bronchographic Observations in Collapsed Lungs 898

ROSSELET, A. Radiologic Image of the Mid-Axillary Zone 898

HODGSON, CORRIN H., AND HINSHAW, H. CORWIN. The General Practitioner and the Clinical Investigation of Some Chronic Pulmonary Diseases 898

RAVITCH, MARK M., AND HARDY, JANET B. Congenital Cystic Disease of the Lung in Infants and in Children 898

ARBUCKLE, ROBERT K. Solitary Tumors of the Chest. Differential Diagnosis in Fifty Proved Cases 898

MEREDITH, H. CLARKSON, JR. Intrathoracic Hour-Glass Ganglioneuroma 899

LOURIA, MILTON R. Intrathoracic Sympathoblastoma 899

STANGL, ANNI. Diagnosis of Bronchial Carcinoma by Means of Tomography 899

LIVERUD, KJELL. Tuberculoma—Simulating Cardiac Aneurysm of Localized Pericardial Effusion 899

OLSEN, ARTHUR M., AND HINSHAW, H. CORWIN. Tuberculosis of the Trachea and Major Bronchi. Results of Treatment with Streptomycin 899

HEAD, JEROME R., AND MOEN, CHESTER W. Late Nontuberculous Complications of Calcified Hilus Lymph Nodes 900

ZIMMERMAN, IRVING, AND MANN, NORMAN. Boeck's Sarcoid: A Case of Sarcoidosis Complicated by Pulmonary Emphysema and Cor Pulmonale 900

GIFFORD, BYRON L., AND KRAUSE, ARLINGTON C. Differential Diagnosis of Boeck's Sarcoidosis. Report of Ten Cases with Ocular Involvement 900

TAYLOR, ASHTON B., AND BRINEY, ALLAN K. Observations on Primary Coccidioidomycosis 901

PILLOW, RANDOLPH P., AND FINNEGAN, THEODORE E. Recognition of the Late Pulmonary Residuals of Coccidioidomycosis 901

GOUGH, J., ET AL. A Comparison of the Radiological and Pathological Changes in Coalworkers' Pneumoconiosis 902

FLETCHER, C. M., ET AL. Classification of Radiographic Appearances in Coalminers' Pneumoconiosis 902

DOIG, A. T. Industrial Siderosis 902

HOFFMAN, I. LOUIS, AND HUARD, GEORGE S. Report of Case of Loeffler's Syndrome with a Concomitant Non-Specific Maculo-Papular Rash 903

HORTON, SAMUEL H., JR. Creeping Eruption. Report of Case with Loeffler's Syndrome 903

CAIN, JAMES C. Epidemic Pulmonary Disease 903

ROSSIER, P. H., AND BÜHLMANN, A. Oil Pneumonia Following Protracted Use of Liquid Paraffin as Nose Drops 903

MASSON, JOHN M., AND HARTMAN, SEYMOUR A. Sterile Hemopneumothorax Caused by Softening and Perforation of a Pulmonary Infarct 903

SWEET, RICHARD H. Intrathoracic Goiter Located in the Posterior Mediastinum 903

MACLEAN, ALEX, AND ROGEN, ALFRED. Mass Miniature Radiography in the Detection of Heart Disease 903

RING, GORDON C., ET AL. Measurements of Heart Output by Electrokymography 904

DOTTER, CHARLES T., AND STEINBERG, ISRAEL. Clinical Angiocardiography: A Critical Analysis of the Indications and Findings 904

THOYER-ROZAT, P., AND PIEQUET, J. Angiocardiography, Its Clinical and Radiologic Interest 905

LICHTENSTEIN, A. Diagnosis and Therapy of Congenital Heart Disease 905

SMITH, K. SHIRLEY, AND WOOD, FRANKLIN G. Radiokymography in Patent Ductus Arteriosus 905

COSBY, RICHARD S., AND GRIFFITH, GEORGE C. Interatrial Septal Defect 905

GASUL, BENJAMIN M., ET AL. Tricuspid Atresia 906

GOODWIN, J. F., ET AL. Transposition of the Aorta and Pulmonary Artery Demonstrated by Angiocardiography 906

DOTTER, CHARLES T., ET AL. Anomalous Right Pulmonary Vein Entering the Inferior Vena Cava: Two Cases Diagnosed During Life by Angiocardiography and Cardiac Catheterization 906

HARRISON, C. V., AND WOOD, PAUL. Hypertensive and Ischaemic Heart Disease: A Comparative Clinical and Pathological Study..... 906

The Digestive System

JUTRAS, ALBERT, ET AL. Radiologic Study of the Paradiaphragmatic Esophagus and of the Cardia..... 907
ALLISON, P. R. Obstruction of the Gastro-Oesophageal Junction..... 907
PALMER, EDDY D. A Consideration of Certain Sources of Error in the Positive Diagnosis of Gastric Carcinoma..... 908
BRICK, IRVING B. Hiatus Hernia and Carcinoma of the Stomach and Esophagus..... 908
GLOTZER, SOL. Fluid in the Lesser Omental Sac as a Cause of Extra-Gastric Pressure Defect.. 908
SKAPINKER, SAMUEL. Intestinal Obstruction Due to Ascaris..... 908
SILVIS, RICHARD S. Carcinoma of the Ascending Colon.. 908
DI RENZO, S., AND MOSCO, LIDIO G. Radiologic Diagnosis of Epiplopericolitis..... 909
SMYRNIOTIS, P. C. The Value of Appendiceal Pain in the Roentgen Diagnosis of Chronic Appendicitis..... 909
RIOPELLE, J. L. New Elastic Fibers Formed in the Wall of the Gallbladder in Disease of the Gallbladder. Pathologic, Clinical and Roentgenological Data Concerning a Hitherto Neglected Lesion..... 909
RYAN, JOHN D., ET AL. Observations on Biliary-Pancreatic Dynamics in a Normal Human... 909
MOURAO, MILTON M., AND SCHINDLER, RUDOLF. Pancreatic Lithiasis and Gastritis (Cases with Gastroscopic Observations)..... 910
ZECH, R. L. Acute Pancreatitis Following Cholangiography..... 910

The Musculoskeletal System

WALTHARD, B., AND ZUPPINGER, A. Eosinophilic Granuloma of Bone..... 910
HILL, R. M. Non-Specific(Eosinophilic) Granuloma of Bone..... 911
WHITE, J. A. Secondary Haemangioma of Bone. 911
HALLIDAY, JOHN. A Rare Case of Bone Dystrophy..... 911
NASSIM, J. R., AND MARTIN, N. H. Masked Steatorrhoea Revealed by Pseudo-Fractures (Looser's Zones) with Some Observations on Calcium Excretion in Convalescence..... 912
LUDWIG, FREDERICK E. Osteomyelitis Caused by Salmonella Paratyphi..... 912
ROCHE, MAURICE B. Pathology of Neural-Arch Defects..... 912
HADLEY, LEE A. Constriction of the Intervertebral Foramen. A Cause of Nerve Root Pressure..... 912
RALSTON, EDGAR L., AND THOMPSON, WALTER A. L. Diagnosis and Repair of Pseudoarthrosis of the Spine..... 913
KNUTSSON, FOLKE. Myelogram Following Operation for Herniated Disc..... 913
CHATTERTON, C. C. Radiographic Evidence of Intermittent Protrusion of an Intervertebral Disc..... 913
COOPER, GEORGE JR., AND FRANKEL, CHARLES J. Diagnosis and Treatment of Carpal Injuries... 913
CHRISMAN, O. D., AND SHORTELL, J. H. Fractures of the Distal End of the Radius Complicated by Fractures of the Carpal Scaphoid..... 914
PONSETI, IGNACIO V., AND FRIEDMAN, BARRY. Evolution of Metaphyseal Fibrous Defects..... 914
HART, VERNON L. Congenital Dislocation of the Hip. Early Recognition and Treatment During the First Six Months of Life..... 914
SPEARS, GEORGE N., AND OWEN, J. T. Etiology of Trochanteric Fractures of the Femur..... 915
HEYMAN, CLARENCE H., AND HERNDON, CHARLES H. Congenital Posterior Angulation of the Tibia..... 915

The Blood Vessels

MOORE, H. D. A New Method of Venography with Particular Reference to Its Use in Varicose Veins..... 915

Gynecology and Obstetrics

WILLIAM, BRYAN. A New Contrast Medium for Hysterosalpingography..... 916
STEVENSON, CHARLES S. X-Ray Visualization of the Placenta: Experiences with Soft-Tissue and Cystographic Techniques in the Diagnosis of Placenta Previa..... 916
ANDERSON, GEORGE W., AND BUSBY, TRENT. Sickle Cell Anemia and Pregnancy..... 916
THOMS, HERBERT, AND CHENEY, CHARLES B. Outlet Pelvimetry. Results in Measuring the Symphysis-Biparietal and Sacral-Biparietal Diameters in 145 Primiparous Women..... 916

The Genito-Urinary System

FRIEDMAN, LOUIS J., ET AL. Pyelography by Rapid Injection. Description of an Improved Method and Results in 200 Cases... 917
GRIFFITHS, I. H., AND THACKRAY, A. C. Parenchymal Carcinoma of the Kidney..... 917
LICH, ROBERT, JR., AND GRANT, OWSLEY. Retrocaval Ureter..... 917
GIBSON, H. M. Ureteral Reflux in the Normal Child..... 918
TEASLEY, GERALD H. Cystitis Emphysematosa: Case Report with a Review of Literature..... 918
EDLING, NILS P. G. Radiological Aspect of the Utriculus Prostaticus During Urethrocystography..... 918

Technic

SCOTT, WENDELL G., AND MOORE, SHERWOOD. Development of the Tautograph and the Advantages of Automatization in Cardiovascular Angiography..... 918

RADIOTHERAPY

WASSON, W. WALTER. What Further Contribution Can Radiology Make to Medicine?..... 919
WOOD, CONSTANCE A. P. Some Factors Influencing Response of Cancer to Radiation..... 919
WEINBREN, M. Present Status of Radio-Therapy and the Radio-Isotopes in the Treatment of Cancer..... 919
DE BACKER, JEAN. Contribution to Study of Contact Roentgen Therapy..... 919
TRAENKLE, HERBERT L. Routine Management of Carcinoma of the Skin and Lips..... 919
BACLESSE, FRANÇOIS. Roentgentherapy in Cancer of the Hypopharynx..... 919
SOSMAN, MERRILL C. Cushing's Disease—Pituitary Basophilism. Caldwell Lecture, 1947.. 920
DARGENT, M., PAPILLON, J., AND GUINET, P. Radiosensitization of Thyroid Epitheliomas by Amino-thiazol..... 921
JENTZER, A., AND CLERC, R. Treatment of Cancer of the Breast (Halsted Amputation, Radium Seeding, Radium-Bearing Corset; Personal Method)..... 921
ARIEL, IRVING M., ET AL. Use of Interstitial Radon Seeds and Needles in Inoperable Lung Cancer..... 921
HEYMAN, J., AND BELONOSCHKIN, B. Surgical Intervention in Recurrent and in "Radioresistant" Cancer of the Uterine Cervix..... 922
JACOBS, ARTHUR. Symposium Carcinoma of the Bladder. Treatment by Radium..... 922
RICHES, E. W. Symposium: Carcinoma of the Bladder. Some Further Aspects of Treatment..... 922
MILLEN, J. L. E. Symposium: Carcinoma of the Bladder. Treatment by Radon Seed Implantation and Deep X-Ray Therapy..... 922
RINKER, J. ROBT. Implanter for Radon Seeds for Use with the McCarthy Foroblique Pan-Endoscope..... 922
MARQUÈS, P., AND BÉTOULIÈRES, P. The Leukemias. The Actual Position of Radiotherapy..... 923
SCOTT, RONALD B. Place of Radiotherapy in the Treatment of Chronic Lymphoid Leukemia.. 923
FULTON, J. S. Radiotherapeutic Treatment of Leukaemia..... 924
HULTBERG, SVEN. Short-Distance Low-Voltage Roentgen Therapy of Inflammatory Conditions in the Tonsils..... 924
WHITE, CHARLES M., AND ROMBOLD, CHARLES. Value of X-Ray Therapy in Orthopedic Cases..... 924
MCCURRACH, A. C., ET AL. Subacromial Bursitis. A Classification and Evaluation of the Results of Roentgen Therapy..... 924
ABEL, MARTIN S., AND LOMHOFF, IRVING I. Treatment of Bursitis and Peritendonitis Calcarea of the Shoulder Joint by Roentgen Therapy..... 924

RADIOISOTOPES

SCOTT, KENNETH G., ET AL. Deposition and Fate of Plutonium, Uranium, and Their Fission Products Inhaled as Aerosols by Rats and Man..... 925
MÜLLER, J. H. On the Multiple Possibilities of a Long-Life Artificially Radioactive Isotope (Co^{60}), in Fluid Form, for the Radiation Therapy of Malignant Tumors..... 925

EFFECT OF RADIATION

HUNTER, F. T., ET AL. Protection of Personnel Engaged in Roentgenology and Radiology.. 925
HULTBERG, SVEN. Three Cases of Irradiation Injuries..... 926
POHLE, ERNST A., AND FRANK, RALPH C. Radiation Osteitis of the Ribs. Report of a Case with Fractures Appearing Four and One-Half Years and Eleven Years After Therapy. 926
MONTGOMERY, ANDREW H., ET AL. Problem of Plantar Radiodermatitis..... 926
PAUL, THOMAS O. Blood Groups and Effects of Roentgen Irradiation in Retrolental Fibroplasia..... 926

ROENTGEN DIAGNOSIS

THE HEAD AND NECK

Cerebral Angiography. Lyle A. French and Paul S. Blake. Minnesota Med. **32:** 589–595, June 1949.

The indications for cerebral angiography are not closely defined because its full value and significance are not as yet known. In general, it is used whenever it is believed that it might provide knowledge valuable in diagnosis and treatment of an intracranial lesion. The procedure is employed routinely in patients with subarachnoid hemorrhage in order to ascertain the site of vascular rupture. For this purpose, bilateral injection is often done, since lateralizing signs may be minimal. Angiography is also used on patients with suspected brain tumors in whom the side of the lesion is known but ventriculographic studies are deemed inadvisable or are found to be unsatisfactory for exact localization. A further indication is offered by cases in which it would be advantageous to know either the histologic type of tumor or the source of its blood supply.

The authors report their results in 100 consecutive angiographic studies performed from 1939 to 1949. Thorotrast was used as the contrast medium in 10 cases, neo-iopax in 9, and 35 per cent diodrast in 81. The use of thorotrast was discontinued because of the dangers of radioactivity, and neo-iopax was discarded because its injection was associated with a convulsive seizure in 4 of 9 cases in which it was used. Irrespective of the medium employed, 50 per cent of the patients experienced disagreeable sensations over the side of the head, with visible ipsilateral flushing of the face. Two per cent of the patients complained of tingling in the contralateral extremities.

Angiograms were obtained of 21 patients with verified brain tumors, and in 13 (62 per cent) of these furnished evidence of the location of the tumor. The histologic type of tumor was meningioma in 6 cases, angioma in 1 case, glioma in 5 cases, and granuloma in 1 case. In 3 patients angiography was carried out to study the blood supply of a previously verified tumor, in order to ascertain the most feasible method of surgical attack. Angiograms were also made on 42 patients with evidence of subarachnoid hemorrhage, and in 6 (14 per cent) the location of the ruptured aneurysm was determined. Two patients with head injuries had angiographic studies, and in one there was evidence of a subdural hematoma. Thirty-two of the patients presented diagnostic problems; a brain tumor was suspected but in no instance was there angiographic evidence of a neoplasm.

The authors discuss the arteriographic evidence, including vascular displacement and vascular pattern, for the various brain tumors, and for arteriosclerosis, carotid thrombosis, and aneurysms.

Aneurysms are most frequently located at the bifurcations of the large basal vessels, such as the junction of the internal carotid with the anterior or middle cerebral artery. Less frequently they are at the junction of the carotid with the anterior or the posterior communicating artery or on the internal carotid itself. With angiography both the location and size of the aneurysm may be ascertained, though occasionally the sac of the aneurysm is so small that the contrast medium does not enter it, in which case no aneurysm is visualized.

Brain *tumors* are localized by (1) displacement of the normal vessels supplying the brain, (2) enlargement of afferent vessels to a tumor or of efferent vessels from a tumor area, and (3) by pathological changes of blood circulation within the tumor itself.

In *glioblastoma multiforme*, because of the frequency of intraneoplastic arteriovenous aneurysms, the circulation through the tumor is rapid and may be visualized in the arteriogram but not in the venogram. The vascular supply is abundant and the vessels are irregular in arrangement and caliber. Large arteriovenous aneurysms and one or two abnormal veins leading away from the tumor area may be visible. The occurrence of vascular changes only at the periphery of the tumor indicates extensive central necrosis.

Metastatic carcinomas have an abundant vascular supply, with frequent arteriovenous aneurysms and irregular vessels. The presence of normal vessels arranged in annular fashion about the lesion with a faint haze of circulation in the tumor as seen in the arteriogram, but with maximum circulation visible during the venous phase, is characteristic.

Astrocytomas seldom show any vascularity in either the arterial or venous phase. Normal vessels around the tumor have been said to be markedly displaced. Oligodendrogliomas, abscesses, cysts, and cholesteatomas cannot be distinguished from astrocytomas angiographically.

When that portion of a *meningioma's* blood supply furnished by the external carotid artery is visualized, it is practically pathognomonic. In the arteriogram, when the tumor circulation is filled, enlarged vessels leading up to the tumor but ending in brush-like fans at its edge may be seen. These vessels are of constant caliber. Because the circulation through meningiomas is slow, the venogram reveals a diffuse accumulation of dye within the tumor.

Angiomas may show a pattern easily confused with that of a glioblastoma, but they rarely cause a shift of midline structures and seldom produce ventricular deformity.

Arteriosclerosis is not an indication for angiography, but it produces abnormalities sometimes visible in patients suspected of other lesions. The vessels become straight and show striking variation of caliber, even aneurysmal dilatation. A sudden break in continuity of an artery due to intravascular block is characteristic.

In the presence of *carotid thrombosis*, an angiogram done on the opposite side may reveal filling of both hemispheres through collaterals in the circle of Willis.

Nine angiograms; 1 table.

JOHN R. HANNAN, M.D.
Cleveland, Ohio

Diagnosis of Intracerebral Hematomas Following Frontal Lobotomy. Olof Sjöqvist, G. af Björkesten and Ulf Fernström. Acta chir. Scandinav. **98:** 280–287, 1949.

In 1942 Freeman and Watts (Psychosurgery, Springfield, Ill., Charles C Thomas) recommended the injection of a few drops of lipiodol at the completion of lobotomy in order to visualize the plane of section. In the event that transection of the white matter is incomplete, the cut should be enlarged immediately. Under ordinary conditions this would rarely be neces-

sary. The lipiodol may, however, serve another purpose, the early diagnosis of postoperative clots. A shift of the lipiodol drops is probably the earliest sign of intracerebral oozing, thus making possible a diagnosis of intracerebral hematoma even before clinical signs of intracranial expansion have appeared. On the other hand, if the position of the drops is unchanged after twenty-four hours, it may be reliably concluded that no oozing has taken place and that the risk of hematoma is practically absent.

In the authors' series of 99 frontal lobotomies, iodized oil was injected within the plane of section 94 times, and anteroposterior and lateral views were taken immediately. Roentgenograms were repeated one to two days after operation in 57 patients. An unchanged or only slightly changed position of the contrast medium was observed in 53 instances. In 4 cases there was a considerable shift of the contrast medium. In these the roentgen changes were of two types: either there was a bulging dislocation of the lipiodol layer outlining the contour of the hematoma or there was an entirely diffuse broadening of the contrast layer. One patient's condition was completely satisfactory and no further shift took place after another twenty-four hours; he was therefore discharged to a mental hospital on the third postoperative day. In the remaining 3 cases the intracerebral hematomas were verified in second-stage operations.

No harmful effects were observed from the lipiodol, even in cases where it was shown to have entered the ventricular system.

Nine roentgenograms; 1 photograph.

Cerebral Tumours. M. H. Jupe. J. Faculty of Radiologists **1:** 2–14, July 1949. Dorothy S. Russell. Ibid., pp. 15–18. Brodie Hughes. Ibid., pp. 19–22. J. Jackson Richmond. Ibid., pp. 23–27.

A symposium on Cerebral Tumors presented at the annual meeting of the British Faculty of Radiologists in 1948 included the four papers listed above.

The first paper, by Jupe, is confined to angiography in relation to cerebral tumors. The author discusses the anatomy of the cerebral vessels, presenting illustrative diagrams and normal angiograms. He regards the method as very safe and as productive of a good deal of information with less trouble to the patient than is encountered in encephalography and particularly ventriculography. If angiography fails to provide enough information, the latter procedures can still be employed. The method in use at London Hospital is then described. The chief features in interpretation of the angiogram are: (1) displacement of vessels, (2) formation of new pathological vessels, (3) dilatation or obliteration of vessels. Any tumor may cause displacement of vessels. It is impossible, therefore, to distinguish between various space-occupying masses unless there is some special vascular variation. With malignant tumors, especially spongioblastomas, there are lack of detail of vessel outline, mottling, formation of loops and spirals, and abnormal connections with venous channels. In meningiomas the bulk of the blood supply need not come from the internal carotid, so that unless the vessel chiefly involved is injected the tumor will show displacement of vessels only. If the vessels are filled, they are clear-cut. They may appear as a vascular ring outlining the tumor or may be distributed through it. Only displacement has been found with astrocytomas.

Dorothy Russell presents the second paper dealing with the commoner types of cerebral tumors. The location, age incidence, and frequency of occurrence of the following tumors are discussed with brief reference to the best method of treatment: (1) medulloblastoma, (2) ependymoma, (3) oligodendroglioma, (4) astrocytoma, (5) spongioblastoma multiforme.

Hughes in the third paper outlines briefly his views and the views of his colleagues regarding radiodiagnostic and therapeutic methods in their relationship to neurosurgery. The steps in diagnosis of the presence, size, blood supply, and, when possible, type of tumor, by x-ray methods are outlined. First in the order of diagnosis are skull films. Cerebral angiography or air studies are next carried out, depending upon the location of the tumor in the skull. The location of tumors best outlined by angiography and those best delineated by air studies is discussed, as well as indications for both types of study on the same patient.

In general, radical surgery is the treatment of choice, but where radiotherapy can render a tumor smaller and less vascular, it is only a wise precaution to utilize it as a preliminary to surgery. Where a tumor is deemed inoperable, or found so at operation, consideration of the histology may suggest the possible value of irradiation. With this in view, it is customary to obtain a biopsy whenever possible. The single exception is the cerebellar medulloblastoma; here biopsy may lead to dissemination of the tumor and the dramatic regression of signs and symptoms under radiotherapy can be considered sufficient confirmation of its nature.

The last paper, by Richmond, deals with the position of radiotherapy in the treatment of brain tumors. The author reviews the results of treatment in a series of tumors which he had observed from 1943 to 1948, and includes numerous charts to demonstrate the response by various types of growth. He feels that definite progress has been made during recent years in radiotherapy of malignant brain tumors.

Sixteen roentgenograms; 8 charts.

D. R. BRYANT, M.D.
The Henry Ford Hospital

Arteriovenous Aneurysm of the Great Vein of Galen. H. R. I. Wolfe and N. E. France. Brit. J. Surg. **37:** 76–78, July 1949.

The authors have reviewed the literature and found only six cases of arteriovenous aneurysm of the great vein of Galen. They add a case in a 21-year-old woman who had had neurological symptoms from about the age of three years and during the last fifteen years of her life had attacks at intervals of every two or three days. The history was that of "fits," along with sharp, stabbing headaches in the frontal region, radiating to the vertex and occiput. Consciousness was not lost, urine was not voided, and the tongue was not bitten, but the eyes would turn and both arms and legs would twitch. There was a history of mild head trauma at the age of eight and apparently a more severe traumatic episode at the age of twenty, when the patient was unconscious for one hour and after which she was described as being "stupid."

Numerous significant neurological findings are recorded. X-ray films showed a spherical "eggshell" area of calcification in the midline in the parieto-occipital region. Ventriculograms demonstrated deformity of the aqueduct of Sylvius with dilatation of the third and lateral ventricle.

Operation was performed and the tumor was identified as an aneurysm and was not explored. Death ensued on the seventeenth postoperative day.

Autopsy revealed an ovoid varix 3.0 × 2.4 cm. attached to the lower border of the falx cerebri at its junction with the tentorium cerebelli, pressing upon both the tectum of the midbrain and superior vermis of the cerebellum. The walls were 0.5 to 1.0 mm. thick and had the histologic structure of a vein with calcification of the media. Anterosuperiorly, there was connection with four small blood vessels, at least one of which proved histologically to be an artery.

Three figures, including 1 ventriculogram.

J. D. CALHOUN, M.D.
University of Arkansas

Pulsating Exophthalmos Due to Defective Development of the Sphenoid Bone. E. Graeme Robertson. Am. J. Roentgenol. **62:** 44–51, July 1949.

Unilateral pulsating exophthalmos due to defective development of the bony wall of the orbit is rare, but the condition has characteristic features and its recognition obviates the possibility of misguided treatment.

The author reviews the literature and reports one case in detail. His patient was a man of thirty-seven whose left eyeball was prominent and depressed, moving synchronously with the pulse. Roentgen examination showed slight enlargement of the left orbit with depression of the inferior wall. In axial films the appearance was one of uniform translucency and, in contrast to the normal side, no shadows were seen corresponding to the orbital plate of the frontal bone, the lesser wing of the sphenoid, or the orbital plate of the greater wing. Lateral films showed a normal optic foramen with a large pneumatized anterior clinoid process on the right side, while on the left the corresponding structures were absent. In roentgenograms of the base of the skull, instead of the normal foramina ovale and spinosum, a single large foramen opening widely into the foramen lacerum was seen. Encephalograms showed further evidence of the defect in the roof of the orbit, and laminagrams demonstrated absence of the posterior part of the orbital plate of the frontal bone, the lesser wing of the sphenoid, and the vertically directed orbital part of the greater wing. Operative treatment was not considered indicated.

The condition described is so characteristic that, once it is known, a mistaken diagnosis is unlikely. The absence of distressing symptoms, the slow deliberate type of pulsation, and the absence of bruit differentiate it from the unilateral exophthalmos due to arteriovenous aneurysm. In the latter, pulsation is less pronounced and there is usually marked dilatation of the retinal and neighboring veins.

The result of the developmental defect may be properly termed orbital meningocele and encephalocele, but it differs from the better known condition to which these terms usually are applied. In the latter, the roentgen picture is entirely different, for the sac usually escapes from the cranium through a gap between the cribriform plate of the ethmoid and the orbital plate of the frontal bone, and protrudes into the orbit between the latter and the lamina papyracea of the ethmoid. As the defect is usually situated anteriorly in the orbit, the eye is displaced laterally and downward but is not unduly prominent.

Eleven roentgenograms.

E. S. KERKES, M.D.
University of Arkansas

Caries Cranii (Tuberculosis of the Flat Bones of the Vault of the Skull). A. C. de Vet. J. Neurosurg. **6:** 269–278, July 1949.

Caries cranii, or tuberculosis of the flat bones of the skull, is an uncommon disease constituting from 0.2 to 1.37 per cent of all tuberculous lesions of the bones. It usually is due to hematogenous spread and is most frequently found in the frontal and parietal bones.

Two types of the disease are described. (*a*) The *circumscribed type* is usually manifest as a rounded, sharply circumscribed defect through the entire thickness of the skull but involving the inner table to a greater extent than the outer table. The margins of the lesion may at times be indistinct. (*b*) In the *diffuse progressive type* there is widespread infection of the cancellous bone and inner table associated with multiple perforations of the outer table. Both types are associated with infection of the scalp and dura, but cerebral disorders are found infrequently.

The author presents the history of a patient with two lesions of the circumscribed type, clearly demonstrable roentgenographically in the frontal and parietal regions of the skull, and neurologic symptoms. He was cured by surgical removal of the diseased tissue and local application of a streptomycin solution.

Three roentgenograms; 1 drawing.

HOWARD L. STEINBACH, M.D.
San Francisco, Calif.

Tomography of Larynx in Disseminated Pulmonary Tuberculosis. Max Espinoza Galarza. Dis. of Chest **16:** 100–102, July 1949.

The author submits a brief preliminary report indicating that tomography of the larynx is of diagnostic value. This conclusion is based on a study of 10 cases of laryngeal tuberculosis. In almost all of the patients there was agreement between the radiologic and laryngoscopic findings.

Four tomograms.

HENRY K. TAYLOR, M.D.
New York, N. Y.

THE CHEST

Bronchial Peristalsis. Felix G. Fleischner. Am. J. Roentgenol. **62:** 65–69, July 1949.

The author reviews earlier studies of the changes in the lumen and size of the bronchi with respiration, which have been held to indicate the occurrence of bronchial peristalsis. His own observations are based upon bronchographic studies. The findings were of three types, depending upon the degree of filling and the phase of respiration: (1) complete filling of the bronchus with the opaque oil; (2) a thin film of oil coating the bronchial wall, while the lumen contains air; (3) oil irregularly alternating with air, in short columns or droplets, which may show a slow centripetal movement. When the inspiration film showed merely a coating of the bronchial wall, the expiration film in the same subject showed alternating oil and air. In the shortened bronchus there was a crowding together of the oil which formerly lined the surface to form bridges and plugs extending across the lumen and producing an effect of narrowing.

There is no necessity of assuming that this apparent narrowing represents a dent or bend in the entire thickness of the wall, for it must be remembered that the bronchial wall itself cannot be seen radiographically and that it is only the oil and air pattern that is visualized.

The author interprets the phenomenon as the effect of surface tension upon the oil droplets, which probably cause a lifting of the mucosal folds, and attributes the slow centripetal movement to the action of the ciliated epithelium. While it is true that, if peristaltic contractions were actually present, these might cause the oil film to flow together and form plugs, there are several facts which militate against such an explanation: these narrowings are never seen in bronchi completely filled with oil but are observed only where oil and air mix and fill the lumen. Furthermore, it is universally agreed that there is a complete absence of longitudinal muscle systems in the lungs and bronchi.

Thus, while the observations of those who based the theory of peristaltic activity of the bronchi on x-ray studies were correct, their interpretation was erroneous. The present studies permit no conclusions as to the occurrence of bronchial peristalsis.

Two roentgenograms; 1 drawing.

CHALMERS S. POOL, M.D.
University of Arkansas

Bronchographic Observations in Collapsed Lungs. Arquimedes Ramos Diaz. Dis. of Chest **16:** 109–111, July 1949.

Normally the bronchographic findings can be divided into two stages: a phase in which there is filling of the major bronchi and an alveolar phase, in which the lipiodol fills the alveoli and is demonstrable as masses of greater or less density due to the superimposition of shadows. This sequence is absent in the presence of pneumothorax, only the first or canalicular stage being observed. This is regarded as an indication of hypoventilation in pulmonary collapse; it should also be demonstrable in spasms, and in the presence of partial or total obstructions. A similar finding is obtained following phrenicectomy, with the additional occurrence of dilatation of the major bronchi due to relaxation of the muscular layers.

Six roentgenograms.

HENRY K. TAYLOR, M.D.
New York, N. Y.

Radiologic Image of the Mid-Axillary Zone. A. Rosselet. Radiol. clin. **18:** 197–202, July 1949. (In French)

The author describes lesions involving the apex or dorsolateral portion of the right middle pulmonary lobe. It is stated that this portion of the lung not infrequently constitutes an anatomic and physiologic entity with its own bronchus, vessels, and nerves, and that it may be involved in a pathologic process independently of other portions of the lung. Occasionally this zone constitutes a separate and distinct lobe with its own pleural fissure.

Twelve roentgenograms; 6 diagrams.

E. M. SAVIGNAC, M.D.
Detroit, Mich.

The General Practitioner and the Clinical Investigation of Some Chronic Pulmonary Diseases. Corrin H. Hodgson and H. Corwin Hinshaw. M. Clin. North America **33:** 1047–1059, July 1949.

As the title indicates, this is a rather general article on the early diagnosis of some chronic pulmonary diseases, with particular stress on roentgen examination of the chest. The authors outline their recommendations for the study and management of patients in whom roentgenograms reveal abnormal shadows suggesting (1) the lesions of tuberculosis, (2) malignant tumors, (3) acute inflammatory disease, and (4) miscellaneous conditions.

Congenital Cystic Disease of the Lung in Infants and in Children. Mark M. Ravitch and Janet B. Hardy. Arch. Surg. **59:** 1–36, July 1949.

Twelve patients between the ages of 13 weeks and 13 months, suffering from cystic disease of the lung, are presented. Clinically recurrent bouts of infection are characteristic; rupture of a cyst with formation of pneumothorax or empyema has been reported but was not encountered in these children. In two instances tension cysts caused by a ball-valve mechanism were present. Pathologically, honeycomb cysts, unilocular cysts, and congenital bronchiectasis can be distinguished. The cyst walls show a lining of tall columnar ciliated epithelium indistinguishable from that of the bronchi. The bronchiectatic group showed changes identical with those of acquired bronchiectasis, but preferential localization in the right upper lobe was observed. In association with cystic disease, anomalies of the lung, either accessory lobes or anomalous blood supply from the systemic arteries, were commonly present; the latter offer an additional operative hazard.

Diagnosis is based largely on roentgenographic appearance. Atypical appearances were found on subsequent study to be associated with other diseases than cystic lung. Abscess, pneumothorax, and pyopneumothorax are the chief sources of confusion in children. With abscess there is a larger zone of surrounding reaction, and the onset is more acute. Pneumothorax does not produce the smoothly spherical air pocket of cyst, and the tendency of the air to be absorbed may be used as a differential point. Tuberculous cavities may resemble cyst, but are distinguished by the bacteriological findings.

Resection of the cyst or cyst-bearing pulmonary tissue is the recommended treatment. In 10 of the children constituting this series lobectomy and in 1 pneumonectomy was done, with complete relief; one child died of infection while awaiting a deferred operation.

Thirty-two roentgenograms; 18 photographs and photomicrographs; 1 drawing.

LEWIS G. JACOBS, M.D.
Oakland, Calif.

Solitary Tumors of the Chest. The Differential Diagnosis in Fifty Proved Cases. Robert K. Arbuckle. Am. J. Roentgenol. **62:** 52–64, July 1949.

The purpose of the author's study was to determine which of the diagnostic studies offers the most help in arriving at an exact diagnosis in patients who present a solitary tumor of the chest. He discusses briefly roentgenoscopy, roentgenographic studies, sputum studies, planigraphy, histopathologic study of aspirated pleural fluid cells, response to irradiation, hormone assay, artificial pneumothorax, and aspiration biopsy, as to their advantages, disadvantages, and general value as diagnostic adjuncts.

His experience with diagnosis in 50 cases presented in the paper resulted in some interesting impressions. Relative to lung carcinoma, he found that in most instances it was not possible to determine roentgenographically whether the mass originated in the mediastinum or adjacent to it. The primary spherical parenchymal tumors were identical with blood-

borne metastatic lesions. The fact that only one tumor was present and that it was relatively large suggested a primary neoplasm.

Most of the tumors routinely seen proved to be of three types: (*a*) bronchial carcinomas, (*b*) nerve tissue tumors, and (*c*) aneurysms. It was felt that needle aspiration under roentgenoscopic guidance for the purpose of procuring material for histopathologic study afforded the most prompt and accurate method of establishing the diagnosis (74 per cent of the author's cases). No roentgenographic findings can be considered characteristic of any particular type of tumor. In many instances the diagnosis which was finally established was not considered among the possibilities when the first examination was made.

Twenty roentgenograms; 4 tables including details of the cases studied.

E. S. KEREKES, M.D.
University of Arkansas

Intrathoracic Hour-Glass Ganglioneuroma. A Case Report. H. Clarkson Meredith, Jr. Virginia M. Monthly **76:** 288–291, June 1949.

The hour-glass or "dumb-bell" tumors of the chest should be considered in all cases presenting signs of cord compression in the thoracic region. The author reports one case of a large intrathoracic ganglioneuroma which gave signs of cord compression without pain or symptoms referable to the chest. Approximately 105 intrathoracic neurogenic tumors have been reported previously, of which 18 were the hour-glass type.

These neurogenic tumors arise from nerves, ganglia, or the sympathetic chains. The smaller portion of the hour-glass tumor occupies the spinal canal and compresses the cord, while the larger portion projects into the posterior mediastinum, the two being connected by a pedicle, usually through an intervertebral foramen. The size varies considerably. Usually the tumors are hard, well encapsulated, and elastic, causing enlargement of the intervertebral foramen by pressure atrophy or even leading to partial destruction of the lamina, bodies of the vertebrae, or adjacent ribs. The neoplasms are composed of well differentiated adult nerve ganglion cells occurring singly or in groups, delicate nerve fibers, and connective tissue.

Clinically the presenting picture is usually that of the cord compression syndrome, with symptoms averaging from four months to two and a half years in duration. The history is frequently that of a gradually progressing spastic paralysis of the lower extremities associated with sensory disturbances. Pain is present in about 35 per cent of the cases, due usually to pressure on the nerve roots by the intraspinal portion of the tumor. A careful neurological examination will reveal pyramidal tract signs, sensory disturbances with an upper level of anesthesia, and occasionally bladder and rectal sphincter involvement. X-ray studies will usually show a mediastinal mass, enlarged intervertebral foramina, and pressure erosion of the adjacent bony structures.

The treatment is surgical. It is usually better to remove the intraspinal portion first because, if the intrathoracic portion is first removed, edema of the intraspinal portion may result in even greater cord damage. Since 37 to 41 per cent of these neurogenic tumors of the chest have been found to be malignant, it is best to carry out surgery as soon as possible after the diagnosis has been made.

J. E. WHITELEATHER, M.D.
Memphis, Tenn.

Intrathoracic Sympathoblastoma. Milton R. Louria. Dis. of Chest **16:** 75–80, July 1949.

Most of the intrathoracic sympathoblastomas are discovered in children under ten years of age. The tumors start early in life, and no symptoms are present until the mass has attained a size sufficient to cause pressure or degenerative changes take place within the tumor causing cough, fever, and expectoration.

The author gives the history of a 19-month-old male infant from whom a large sympathoblastoma was successfully removed. The parents observed a fullness in the left supraclavicular area when the child cried. Fluoroscopic examination by the family doctor revealed a large mass occupying the upper half of the left pulmonic field, and subsequent films showed a similar finding. Eleven months after operation, the child was apparently well.

As the tumor is malignant and the treatment surgical, early diagnosis is imperative. The author suggests the possibility of extending chest surveys to include the young patients in whom these tumors occur.

Two roentgenograms; 1 photomicrograph; 1 photograph.

HENRY K. TAYLOR, M.D.
New York, N. Y.

Diagnosis of Bronchial Carcinoma by Means of Tomography. Anni Stangl. Radiol. clin. **18:** 206–217, July 1949. (In German)

The importance of tomography for the diagnosis of centrally located cancer of the lung is emphasized. With its use, bronchography may be dispensed with in a number of cases. The method is of considerably less importance in peripheral cancer, because of the smaller size of the bronchi. Bronchial stenosis and obstruction are the main roentgen findings, but the appearance of the abnormal lung tissue is also important. The differentiation lies between tumor, concomitant pneumonia, and atelectasis. A series of cases with diagrams of the tomographic findings demonstrates the value of this type of examination for the diagnosis of bronchial carcinoma.

Ten drawings.

H. W. HEFKE, M.D.
Milwaukee, Wis.

Tuberculoma—Simulating Cardiac Aneurysm or Localized Pericardial Effusion. Kjell Liverud. Acta radiol. **32:** 73–80, July 31, 1949.

The author describes a tuberculoma with pleuropericardial adhesions, simulating a cardiac aneurysm or a pericardial exudate. The roentgenogram showed a uniform, sharply defined expansion or bulge on the upper part of the contour of the left ventricle, continuous with the heart shadow. Pulsations seemed to follow the pulsations of the heart. Death was due to miliary tuberculosis and the true nature of the lesion was determined at autopsy.

The diagnostic difficulties are discussed.

Four roentgenograms; 1 diagram.

E. S. KEREKES, M.D.
University of Arkansas

Tuberculosis of the Trachea and Major Bronchi. Results of Treatment with Streptomycin. Arthur M. Olsen and H. Corwin Hinshaw. Am. Rev. Tuberc. **60:** 32–38, July 1949.

Tracheobronchial tuberculosis has been treated with streptomycin in a number of clinics. The ulcers, diag-

nosed by bronchoscopy, have healed with remarkable rapidity, but the follow-up periods have been short and some recurrences have been reported. For this reason the authors present three early cases in which streptomycin was used. The patients have remained under close observation for from a year and a half to three years since completion of treatment. No recurrence has developed and much less stenosis resulted than was anticipated. In one of the patients lobar atelectasis developed, due to the disease, but cleared following treatment; all had minimal parenchymal lesions. Parenteral (1.0 gm.) and aerosol (0.5 to 1.0 gm. in concentration of 100 mg. per cubic centimeter of saline) methods of administration were used.

The authors do not hesitate to do a biopsy of the endobronchial lesions or to remove granulation tissue; in fact, the removal of obstructing tissue is often essential to adequate treatment. Early and accurate diagnosis of tracheobronchial tuberculosis becomes of great importance now that an effective therapeutic procedure is available.

Five roentgenograms; three drawings.

J. H. JUHL, M.D.
University of Wisconsin

Late Nontuberculous Complications of Calcified Hilus Lymph Nodes. Jerome R. Head and Chester W. Moen. Am. Rev. Tuberc. **60:** 1–14, July 1949.

The late non-tuberculous activation of calcified tuberculous nodes in the pulmonary hilus is believed to be due to secondary infection, with subsequent enlargement producing pressure to the point of occlusion or perforation of a bronchus. Recurrent pneumonia, atelectasis, bronchiectasis, lung abscess, and bronchial ulceration may follow. It is not certain why an apparently healed calcified node should suddenly cause trouble after remaining stationary for years. The authors feel that the calcium, like any other foreign body, invites secondary infection, lymphatics being the usual route.

The predominant site of bronchial perforation in reported cases is the right upper lobe bronchus (30 per cent), with a fairly equal distribution of the remaining cases among the other bronchial branches. Clinical findings are varied; cough, hemoptysis, and expectoration of calcific material are common symptoms. Roentgenographic findings vary with the nature of the complication, but may simulate any type of inflammatory disease with associated atelectasis. Laminagraphy may be of value in revealing a node impinging on a bronchus. It should be remembered that calcifications at the root of a lung may be responsible for parenchymal disease.

Ten cases are reported; in all there was erosion of bronchi followed by expectoration of varying amounts of calcific material. In one instance a broncho-esophageal fistula developed. Lung abscess, recurrent pneumonia, and atelectasis resulted from the bronchial obstruction in the cases reported. Treatment was largely medical, but the authors suggest the possibility of surgical removal of the node or nodes as a method of shortening the course of the disease. In many instances the calcium is extruded and expectorated spontaneously, with consequent closing of the bronchial fistula and clearing up of the infection.

Twelve roentgenograms; 1 photograph.

J. H. JUHL, M.D.
University of Wisconsin

Boeck's Sarcoid: A Case of Sarcoidosis Complicated by Pulmonary Emphysema and Cor Pulmonale. Irving Zimmerman and Norman Mann. Ann. Int. Med. **31:** 153–162, July 1949.

A case of Boeck's sarcoid is reported here which presented severe pulmonary emphysema and consequent right heart failure. The course is regarded as suggestive of an etiologic relationship between Boeck's sarcoid and tuberculosis.

The patient was a Negro boy who first showed roentgen evidence of pulmonary disease at the age of eleven years. At that time the hilar nodes were enlarged and peribronchial infiltration was demonstrabie in both lungs. There was a generalized lymphadenopathy. A tuberculin test was negative, but subsequently a positive reaction was obtained. Biopsy of a cervical lymph node led to a diagnosis of tuberculous lymphadenitis, but no tubercle bacilli were found in the histologic section. Later, however, an axillary node broke down, discharging caseous material which on culture was positive for acid-fast organisms. Sputum and gastric washings were repeatedly negative. Ten years later, when the patient was admitted to the hospital with severe dyspnea and cyanosis, the lungs were markedly emphysematous, but the initial pulmonary lesions had regressed. Death occurred some six months after admission, and autopsy revealed diffuse microscopic granulomatous lesions which were interpreted as Boeck's sarcoid. Similar nodules were found in the liver, spleen, and lymph nodes, and a review of the lymph node section originally diagnosed as tuberculous lymphadenitis suggested that these lesions were also those of sarcoid.

In commenting on the case, the authors state that the slowly progressing and relatively asymptomatic course in a young Negro with extensive pulmonary involvement roentgenologically early in the disease is striking but not uncommon in sarcoid. The anergy to tuberculin which was seen initially is also characteristic. Although progression to caseous tuberculosis is more often a terminal affair, and thus unusual here, the change in the tuberculin reaction has been noted by other observers; *i.e.*, when active tuberculosis develops in sarcoidosis, the anergy to tuberculin disappears and sensitivity is apparent. In view of these observations, it might seem that the tubercle organism was responsible for both the tuberculous and the sarcoid types of tissue reaction, and the progression from a non-caseating to a caseating lesion might well be interpreted as due to a decrease in the resistance of the host or an increase in the virulence of the organism. This, however, is purely speculative. The evidence connecting sarcoid with tuberculosis remains purely circumstantial.

The most logical explanation of the emphysema in the case reported is impingement of the granulomatous nodules upon the terminal bronchioles, causing stenosis of their lumina. Pulmonary hypertension and enlargement of the right heart are attributed to obliteration of the capillary bed by the emphysema.

Four roentgenograms; 2 photomicrographs; 1 electrocardiogram.

STEPHEN N. TAGER, M.D.
Urbana, Ill.

Differential Diagnosis of Boeck's Sarcoidosis. Report of Ten Cases with Ocular Involvement. Byron L. Gifford and Arlington C. Krause. Arch. Ophth. **41:** 667–696, June 1949.

The rarity of sarcoidosis is emphasized by the fact

that since 1927 only about 30 cases have been followed with any degree of regularity from over 450,000 registrations at the University of Chicago Clinics. Ten cases with ocular involvement are presented, with a description of the roentgen findings in each instance.

The authors discuss the difficulties in establishing a clinical diagnosis of Boeck's sarcoidosis, evaluating the more frequent clinical symptoms and signs. The items which they believe are the most important for a correct diagnosis, in the order of their reliability, are: a good history of the disease; clinical evidence of disease simulating sarcoidosis; low cutaneous sensitivity to intracutaneous injection of old tuberculin; biopsy of the skin; lesions of bone, as demonstrated in roentgenograms of the hands and feet; roentgenograms of the chest; biopsy of lymph nodes; gross appearance of cutaneous lesions; examination of the blood for albumin-globulin ratio, and ocular examination.

The findings on chest roentgenograms are of two types: (1) involvement of the hilar nodes, consisting of gross enlargement of the bronchial nodes, or, less often, of the bifurcation of the paratracheal groups, with coarse radiations of dilated deep lymphatic striae extending toward the periphery of the lungs; (2) widespread miliary lesions of irregular size scattered throughout both lungs. The picture may be complicated by the presence of calcified nodes, pleural thickening, effusion, or even cavitation, due presumably to other causes.

Bone lesions appear as punched-out areas with rather sharp borders in the center of the metaphysis, without invasion of the cortex. They are present, however, in a minority of cases.

Ten illustrations, including 5 roentgenograms.

Observations on Primary Coccidioidomycosis. Ashton B. Taylor and Allan K. Briney. Ann. Int. Med. **30:** 1224–1236, June 1949.

This paper concerns itself with observations on 43 cases of primary coccidioidomycosis seen at the Station Hospital, Williams Air Field, Chandler, Arizona, during 1946 and 1947. The patients' ages varied from 18 to 35 years. There were 39 males and 4 females. Of the 39 males, 7 were Negroes and one a Filipino. No deaths occurred in the series. Complement-fixation and precipitin serological tests were employed to establish the diagnosis.

Chest pain was by far the most common complaint. Other symptoms were non-productive cough, malaise, low-grade fever and chills, headache, and occasionally substernal pain on swallowing. The sedimentation rate was invariably elevated.

The types of involvement seen roentgenographically included (1) diffuse pneumonia-like infiltrations, (2) hilar thickening, (3) hilar and mediastinal adenopathy, (4) nodular parenchymal lesions, (5) cavitation, and (6) effusion. In no instance was bony involvement of the chest cage exhibited.

Pneumonia-like infiltrations constituted by far the most common radiologic finding, being present in 35 cases. The majority (21) were isolated peripheral lobular infiltrations, well circumscribed and of homogeneous density. Ten of these infiltrations involved the lower lobes and 10 the basal portions of the upper lobes. Abnormally thickened hilar shadows are a frequent accompaniment of this type of infiltration. Less frequently true hilar adenopathy has been observed. In 14 cases the infiltrations were fan-shaped, radiating from the hilar region out into the lung field. These most resembled primary atypical pneumonitis. Complete resolution of both types of infiltrations occurred in about half the cases within five days to three months. In the others, resolution was incomplete after one to ten months.

Hilar thickening was noted in 28 cases. It consisted of soft peribronchial infiltration which produced fuzzy, widened bronchovascular markings, often difficult to evaluate.

Hilar and mediastinal adenopathy was present in 19 cases.

Discrete fibrous nodules have been said to represent the most characteristic and diagnostically specific finding in primary coccidioidomycosis. When present in this series, they represented incomplete resolution of a previous coccidioidal infiltration, usually of the lobular type.

Progression of nodules to *cavitation* was observed in 2 cases. The cavities remained practically static for periods of five to ten months, and were characterized by lack of inflammatory change in the surrounding area, a moderately thin wall, and upper lobe involvement.

Pleural effusion was noted in three cases and in all was associated with parenchymal infiltrations.

Treatment in every case included bed rest until chest films and sedimentation rates were improved. Activity in the hospital was sharply limited until the sedimentation rate was normal and chest films were either clear or static for at least one week.

The Negro, in general, exhibits more severe symptoms than the white, is more susceptible to the disease, and has a longer convalescent period.

In any patient in an endemic area with predominantly respiratory complaints associated with substernal pain on swallowing the possibility of coccidioidomycosis should be considered.

Five roentgenograms; 1 chart.

STEPHEN N. TAGER, M.D.
Urbana, Ill.

Recognition of the Late Pulmonary Residuals of Coccidioidomycosis. Randolph P. Pillow and Theodore E. Finnegan. Virginia M. Monthly **76:** 298–302, June 1949.

The late residual pulmonary lesions resulting from either symptomatic or asymptomatic coccidioidomycosis are characteristically of two types: (1) cavitation and (2) nodule formation. These lesions must be differentiated from pulmonary tuberculosis, solitary or multiple cysts of the lung, primary and metastatic lung tumors, and bronchiectasis.

Cavitation may occur during or shortly after the acute pneumonic phase of the disease. When observed in the late phase, the cavity appears oval, thin-walled, with a minimal inflammatory reaction in the surrounding tissue, or none at all. The cavity may or may not contain fluid. It is lined by chronic granulomatous inflammatory tissue and may be asymptomatic. It may close in a matter of three to five months or remain open indefinitely with no change in the roentgen appearance.

The acute pneumonic process may fail to resolve completely, leaving a dense, well circumscribed *nodular lesion* of hyaline scar tissue, which is permanent. It may form in ten days to three months after the initial pneumonitis.

A positive history of residence in an endemic area

is of great value in the diagnosis of these residual findings, but since the initial illness may have been asymptomatic, the patient may be unable to recall it. Quite frequently the roentgen appearance of the lesion is so significantly characteristic that a presumptive diagnosis can be made. Skin test with potent coccidioidin in 1/1,000, 1/100, and 1/10 dilutions is generally specific. Sputum or gastric washings should be studied by smear or culture on Sabouraud's medium for the spherule or mycelial phase of the fungus. A serologic test is carried out by using the patient's serum and coccidioidin as an antigen. The precipitin test is seldom positive in the late cases. Should the complement-fixation titer begin to rise in the presence of a residual lesion, dissemination of the fungus infection should be strongly suspected.

The author reports 4 cases seen in the Eastern states, all in persons with a history of residence in Southern California. In one case a cavity in the left lung had completely disappeared at the end of two years. In the others the pulmonary lesions appeared unchanged in serial films.

J. E. WHITELEATHER, M.D.
Memphis, Tenn.

A Comparison of the Radiological and Pathological Changes in Coalworkers' Pneumoconiosis. J. Gough, W. R. L. James, and J. E. Wentworth. J. Faculty of Radiologists 1: 28–39, July 1949.

This interesting paper compares the radiological appearance of pulmonary changes produced by pneumoconiosis in Welsh coal workers with pathological changes found at autopsy. The authors describe a rather unusual technic for preparing and cutting sections of the entire lung in the sagittal plane. A section approximately 600–700μ in thickness is mounted on paper so that it can be viewed with transmitted light. The lesions in the lung can then be compared with radiographs made during life. Comparison of sections and films has demonstrated that "reticulation" or "granularity" is due to focal dust lesions ("coal nodules"). A distinctive emphysema develops in coal nodules which it is difficult to evaluate roentgenologically but it was found that the net-like appearance in the films corresponded to the severe focal emphysema. These studies also demonstrated that massive fibrosis due to infected pneumoconiosis could be accurately diagnosed radiologically except for occasional confusion with neoplasms.

Six roentgenograms; 8 photographs.

D. R. BRYANT, M.D.
The Henry Ford Hospital

Classification of Radiographic Appearances in Coalminers' Pneumoconiosis. C. M. Fletcher, K. J. Mann, I. Davies, A. L. Cochrane, J. C. Gilson, and P. Hugh-Jones. J. Faculty of Radiologists 1: 40–60, July 1949.

The authors of this article feel that a sound classification of pneumoconiosis is necessary, particularly one that can be used and understood internationally.

This entails separate definition of qualitative and quantitative groups, the qualitative groups corresponding to distinguishable pathological processes and the quantitative groups defining increasing degrees of abnormality within each qualitative group; a simple system of coding; provision of adequate illustrations; standardized radiographic technic; determination of errors arising in the use of the classification and a system of assessment of films which will reduce these errors.

The system of classification used by the Pneumoconiosis Research Unit of the Medical Research Council of Great Britain, is held to meet these requirements. Two main qualitative types are recognized, with various subsidiary types and quantitative divisions:

1. Simple pneumoconiosis
   - Subsidiary types:
     - Mixed
     - Pinhead
     - Granular nodulation
     - Homogeneous nodulation
     - Cobweb
     - Chronic bronchitic
   - Quantitative divisions:
     - Minimal
     - Moderate
     - Marked
     - Maximal
2. Complicated pneumoconiosis
   - Subsidiary types:
     - Multiple fluffy shadows
     - Faint massive shadows
     - "Cricket-ball" shadows
     - Bilateral reniform shadows
     - "Angel-wing" shadows
   - Quantitative divisions:
     - Ambiguous shadows
     - Massive shadows
     - Avanced massive shadows
     - Advanced massive shadows with pulmonary distortion

The authors feel that this system has considerable advantages over other systems previously used. The radiographic technic is described and a simple coding method is included.

Nineteen roentgenograms; 1 table.

D. R. BRYANT, M.D.
The Henry Ford Hospital

Industrial Siderosis. A. T. Doig. Edinburgh M. J. 56: 230–234, June 1949.

Certain dusts, among them tin and iron, appear quite inert when inhaled into the lungs. The particles are deposited in the lymphoid aggregations just as coal dust is. There they lie inertly without leading to any reaction or changes. They produce an abnormal picture because the aggregations become relatively radiopaque by reason of their metallic content. The roentgenograms of welders who have spent many years at this work may show dust reticulation, but the welder has no diminished capacity for work. Siderosis is usually defined as fibrosis due to the inhalation of iron or steel dust, but the only postmortem examination of a welder reported showed no evidence of fibrosis around the collection of iron dust.

The presence of pulmonary fibrosis in and around dust aggregations cannot be diagnosed from examination of a single x-ray film; the film of a welder may be indistinguishable from that of a sandblaster with silicosis, or a miner with pneumoconiosis. The small densities forming reticulation or nodulation may be due to a variety of conditions, of which nodular fibrosis is only one. While the x-ray changes in silicosis, asbestosis, and pneumoconiosis are permanent or even pro-

gressive, those in welders may improve (Lancet **1:** 789, 1948. Abst. in Radiology **52:** 749, 1949).

Report of Case of Loeffler's Syndrome with a Concomitant Non-Specific Maculo-Papular Rash. I. Louis Hoffman and George S. Huard. Mil. Surgeon **105:** 7–12, July 1949.

A case of Loeffler's syndrome with a maculo-papular rash is reported. In the differential diagnosis, the following possibilities were considered: infectious mononucleosis, brucellosis, atypical typhoid, miliary tuberculosis, virus pneumonia, meningococcemia, septicemia, trichinosis, and ascariasis. The final diagnosis was based upon the sudden infiltration of the lungs which cleared rapidly, a peripheral eosinophilia of up to 28 per cent, the demonstration of numerous eosinophils in a smear from a papule and in the sputum, and the negative results of all laboratory and skin tests. The patient showed a definite decrease in vital capacity.

Findings which did not fit into the pattern of Loeffler's syndrome were a slightly enlarged tender liver, increased urobilinogen in the urine, and an increased indirect van den Bergh reaction.

This is believed to be the first case of Loeffler's syndrome recorded with a rash of the character described.

Three roentgenograms.

Creeping Eruption. Report of a Case with Loeffler's Syndrome. Samuel H. Horton, Jr. U. S. Nav. M. Bull. **49:** 703–706, July–August 1949.

A case of creeping eruption with an associated Loeffler's syndrome is reported. The patient, a 27-year-old male, was admitted to a naval hospital, complaining of pruritus and a non-productive cough. The lungs were negative to auscultation and percussion. A diagnosis of creeping eruption was made, and treatment with fuadin and ethyl chloride spray was instituted. After the third day, improvement of the skin lesions was noticed, but the patient continued to complain of a dry hacking cough. For the first time inspiratory râles were heard over the right mid-lung field posteriorly, but these disappeared after two days. An eosinophilia of 7 per cent had been found on admission and when chest roentgenograms now suggested an acute pneumonitis the diagnosis of Loeffler's syndrome was apparent. The eosinophilia reached 46 per cent before gradually returning to normal. The sedimentation rate was repeatedly normal. Serial roentgenograms confirmed the transitory character of the pulmonary infiltrations.

Three roentgenograms; 2 photographs.

Epidemic Pulmonary Disease. James C. Cain. M. Clin. North America **33:** 1099–1110, July 1949.

Four severe epidemics of an unusual form of pulmonary disease have been described in the literature (see, for example, Cain, Devins, and Downing: Arch. Int. Med. **79:** 626–641, 1947. Abst. in Radiology **50:** 556, 1948). Two of the epidemics occurred at Camp Gruber, Okla., one at Camp Crowder, Mo., and the other in southwestern Arkansas. The sources of infection of these epidemics appear to have been underground or dusty enclosures. The author reviews these reports and discusses the etiology, clinical features, and the pathologic and roentgen appearances of the condition. The roentgen picture is described quite fully in the paper and abstract cited above.

Two roentgenograms; 1 chart.

Oil Pneumonia Following Protracted Use of Liquid Paraffin as Nose Drops. P. H. Rossier and A. Bühlmann. Schweiz. med. Wchnschr. **79:** 685–686, July 30, 1949. (In German)

After a review of the literature, the authors report a case of lipoid pneumonia of the right lower lobe in a 50-year-old man with atrophic rhinitis, who had used about 150 c.c. of mineral oil nose drops per week for twenty years. Even several weeks after discontinuing the drops the sputum contained many globules of mineral oil. The course was one of gradual improvement.

Two roentgenograms; 1 photomicrograph.

LEWIS G. JACOBS, M.D.
Oakland, Calif.

Sterile Hemopneumothorax Caused by Softening and Perforation of a Pulmonary Infarct. John M. Masson and Seymour A. Hartman. Dis. of Chest **16:** 42–48, July 1949.

The authors give the history of a 30-year-old white male with chronic rheumatic heart disease, in whom hemopneumothorax following perforation of a pulmonary infarct was diagnosed during life and proved postmortem. In a review of the literature in 1947, Rawson and Cocke found only 5 cases of necrotic pulmonary infarcts resulting in hemopneumothorax; to these, they added one of their own (Am. J. M. Sc. **214:** 520, 1947. Abst. in Radiology **51:** 436, 1948). In all of these the diagnoses were made postmortem.

Five roentgenograms; 1 photograph.

HENRY K. TAYLOR, M.D.
New York, N. Y.

Intrathoracic Goiter Located in the Posterior Mediastinum. Richard H. Sweet. Surg., Gynec. & Obst. **89:** 57–66, July 1949.

This excellent and well illustrated paper points out that intrathoracic goiters are frequently located in the posterior mediastinum and are not necessarily anterior to the recurrent laryngeal nerve and inferior thyroid artery, as popular medical teachings lead one to believe. To clarify terminology, the author designates substernal goiters as those where the largest component of the goiter lies above the sternum and in the neck. Intrathoracic goiters are those where the largest component lies below the thoracic inlet. Of the latter there are two major types, anterior and posterior. The recurrent laryngeal nerve, inferior thyroid artery, carotid sheath, the innominate veins, and on the right the superior vena cava, lie in front of the posterior mediastinal goiter and behind that in the anterior mediastinum.

The author discusses the technical difficulties encountered in attempting to remove posterior mediastinal goiters via a cervical incision. In 3 of the 6 cases reported, it was necessary to do a thoracotomy in order to remove the goiter.

Twelve roentgenograms; 2 drawings.

SAM H. SEAL, M.D.
University of Pennsylvania

Mass Miniature Radiography in the Detection of Heart Disease. Alex Maclean and Alfred Rogen. Brit. Heart J. **11:** 264–270, July 1949.

Of 34,918 persons examined (two-thirds of them under the age of twenty), in the course of a survey con-

ducted by the Glasgow Mass Radiography Unit, 1,703 were recalled for clinical cardiac study. Unusual cardiovascular shadows, a history of previous rheumatic infection, and a history of known heart disease were the criteria for recall, and were found in the order given.

General cardiac enlargement was reported 516 times, but in only 93 cases was organic heart disease found on clinical examination. Inexperienced examiners probably account for this inaccuracy, failing to allow for the distortion of the cardiac silhouette on the miniature film. Prominence of the pulmonary artery was also misleading, only 17 cases of heart disease being found among 418 subjects. Prominence of the pulmonary conus was more reliable; 25 cases of organic disease were found in 93 persons in whom this finding was reported.

Of 529 patients who believed they had organic heart lesions, 340 failed to show any evidence of disease.

It is interesting that among the 34,918 persons included in this survey only 21 cases of valvular disease were revealed for the first time by x-ray.

Seven tables. ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Measurements of Heart Output by Electrokymography. Gordon C. Ring, Miriam Balaban, and M. J. Oppenheimer. Am. J. Physiol. **157:** 343–351, June 1949.

A method for measuring the output of the heart with the aid of the electrokymograph is described. The top of a fluoroscopic table was removed from its base and supported by four vertical springs, providing a ballistic table similar to that described by Nickerson, et al. (J. Clin. Investigation **26:** 1, 1947). Movements of the table top are recorded by means of a light beam reflected from a pivoted mirror onto bromide paper. Using the same camera, the movements of the string galvanometer activated by the electrokymograph are simultaneously recorded. The electrokymograph head is provided with an opening 3 cm. in diameter through which x-rays can pass to excite a fluorescent screen. A wafer grid, attached beneath this screen, eliminates the effects of scattered x-rays. Enclosed in the same housing and 4 cm. above the wafer grid is the 931-A photomultiplier tube. Beneath the top of the table, a solenoid is arranged to swing presdwood (6 mm. thick) into and out of the x-ray beam. This is used to calibrate the movements of the heart recorded by the electrokymograph. For measuring the thickness of the heart, a phantom of presdwood 5 cm. thick is provided.

The procedure followed in the experiments was as follows: the subject lay on the table with his feet firmly against the footboard. He was then told to take a deep breath and, with fluoroscopic guidance, the electrokymogram head was placed over the heart shadow and slightly nearer the apex than the base. Care was taken not to have any part of the head over the spine shadow. The amplification in the galvanometer circuit was adjusted to give a suitable record. After this the subject was allowed to breathe until the rate returned to normal. The subject was then instructed to take a deep breath and hold it while the ballistocardiograms and electrokymographic densograms were simultaneously recorded. The experimenter constantly watched the shadow of the galvanometer string and put in a calibration at the end of every other systole, recording 2 strips of about 30 beats during each breath holding. Then the head was moved about 5 mm. away from what was judged to be the ideal position for recording. The purpose of this was to see if the densograms recorded in the second position differed from those obtained first. A series of responses to calibrations over the chest walls and lungs to the right of the spine was next recorded. From this result and the calibrations over the heart, the anteroposterior thickness of the heart was determined.

The x-ray tube was operated at 80 kv. and $2^1/_2$ ma. This produced 8 r per minute at the patient's skin. The exposure in the area under the heart averaged three minutes and on the right side of the chest a minute and a half. Since the x-rays were coned down as soon as the head was properly placed, the total exposure of any skin area was small; therefore, frequent repetition of the procedure is possible without appreciable harm to the patient.

This method gives a measure of the anteroposterior thickness of the heart both in systole and diastole. An inverse relation between thickness of the heart and its contractile power is suggested from these observations.

Five figures; 2 tables.

Clinical Angiocardiography: A Critical Analysis of the Indications and Findings. Charles T. Dotter and Israel Steinberg. Ann. Int. Med. **30:** 1104–1125, June 1949.

This paper on angiocardiography, summing up the essential developments in this field, is recommended as one of the best contributions to the subject in a rapidly growing literature. It is based upon an experience of eleven years, in which over 1,000 patients have been studied without a fatality. The majority of the studies were done by the original technic of Robb and Steinberg (Am. J. Roentgenol. **41:** 1, 1939. Abst. in Radiology **34:** 518, 1940), but for a period of eighteen months neo-iopax has been used instead of diodrast and has proved to be a satisfactory medium.

While valuable physiological data have been gained through contrast cardiovascular visualization, the chief value and direction of approach have been anatomical. The procedure has been of particular value in the definitive diagnosis of certain abnormal states, the findings in which are described and illustrated.

The combined facilities of angiocardiography and heart catheterization have made possible the accurate diagnosis of the great majority of cardiac anomalies during life. Among these are coarctation of the aorta, patent ductus arteriosus, tetralogy of Fallot, congenital aneurysm of the pulmonary artery and isolated pulmonic stenosis, and anomalous pulmonary veins.

Many diagnostic problems related to acquired heart disease have also benefited by angiocardiography, notably the diagnosis of syphilitic aortitis, the differentiation of aneurysm from mediastinal tumor, and the diagnosis of pericardial effusion. The angiocardiographic signs of syphilitic aortitis are abnormal dilatation of the ascending aorta (above 38 mm. caliber), as measured in the left anterior oblique projection; irregularity of the aortic lumen; variations in aortic wall thickness, and aortic aneurysm. Dilatation, the most significant evidence of the early changes in syphilitic aortitis, must be evaluated with care, since it may also be caused by hypertension, non-syphilitic aortic insufficiency, and by congenital anomalies of the aortic arch. Angiocardiography cannot be relied upon to distinguish

between syphilitic and congenital aneurysms of the aortic arch, and clinical judgment must be the eventual deciding factor when this possibility arises.

The changes of dissecting aneurysm of the aorta as seen angiocardiographically are distinctive. The aortic lumen is more or less abruptly narrowed, and the aortic walls are thickened at the site of the dissection. Contrast substance has been angiocardiographically demonstrated within false passageways formed by dissecting aneurysms.

By outlining cardiovascular structures in contact with the inner or "hidden" margins of mediastinal tumors, angiocardiography serves to delimit and more accurately localize the mass within the mediastinum as well as rule out the presence of aneurysm. Further evidence of a differential nature is gained by the demonstration of the effect of a tumor upon the great vessels. Thus, while a dermoid cyst may be seen to displace major vessels, a malignant thymoma or teratoma shows a tendency to cause stenotic or obstructive changes.

Pericardial effusion is demonstrated with ease and certainty by angiocardiography. Films timed to show right atrial opacification demonstrate the presence of an increased non-opacified area between the right atrium and the right lung field. Visualization of the left ventricular cavity in the presence of pericardial effusion shows its outer border to be well within the left margin of the cardiac shadow, thereby demonstrating the presence of fluid on the left side.

Sixteen roentgenograms.

STEPHEN N. TAGER, M.D.
Urbana, Ill.

Angiocardiography, Its Clinical and Radiologic Interest. P. Thoyer-Rozat and J. Piequet. J. de radiol. et d'électrol. **30:** 3–11, 1949. (In French)

The authors describe the technic of angiocardiography employed at the Hôpital de la Pitié, Paris. Their report is a résumé of their experience gleaned in the examination of 40 patients. They particularly stress the contraindications to angiocardiography. The first is sensitivity to iodine as exhibited by cutaneous reactions or other clinical signs; others are evidence of nephritis, hepatitis, myocardial afflictions with complications of conduction, and coronary disease. The authors review the information which may be derived from angiocardiography in relation to congenital anomalies, malformations of the pulmonary arteries in adults, malformations of the aorta, the morphology of the branches of the pulmonary artery in relation to pulmonary pathology. The procedure furnishes information, also, on the topography, form, volume, and structure of the cavity of the heart and the thickness of the myocardium.

In closing, stress is again laid upon the dangers of the procedure and the necessity for a very careful clinical scrutiny of the patient before the method is contemplated.

Eight roentgenograms; 8 drawings

SIMEON T. CANTRIL, M.D.
Seattle, Wash.

Diagnosis and Therapy of Congenital Heart Disease. A. Lichtenstein. Irish J. M. Sc., pp. 315–324, July 1949.

The author briefly reviews the development of the historical knowledge of congenital heart disease and the theories of the mechanism of its production and presents the special technics by which a diagnosis may be made. Three types of malformation amenable to surgery are discussed: patent ductus arteriosus, coarctation of the aorta, and pulmonary stenosis. The differential diagnosis and surgical considerations are reviewed, and results of operation in 259 patients treated in Stockholm are presented. The operative mortality rate was 4.8 per cent for 41 cases of coarctation; 2.5 per cent for 160 cases of patent ductus arteriosus; 20.3 per cent for 58 cases of the morbus caeruleus group.

Five roentgenograms; phonocardiograms and blood-pressure tracings; 3 tables.

HARRY J. PERLBERG, M.D.
New York, N. Y.

Radiokymography in Patent Ductus Arteriosus. K. Shirley Smith and Franklin G. Wood. Brit. Heart J. **11:** 257–263, July 1949.

Applying kymography to the diagnosis of patent ductus arteriosus, the authors have found four separate signs. Postero-anterior views were obtained, supplemented by oblique views (especially left oblique) when desirable.

1. *Para-aortic Waves.* These are wave forms seen lateral and parallel to the aortic knob but of less density. They disappear after the ductus is ligated and are considered to represent pulsation of the ductus itself.

2. *Vibration Waves.* These are fine waves of a frequency of around 400 a minute occurring in a narrow region immediately below the aortic waves. In the left oblique position they have been found on the border of the ascending aorta. The authors believe that these waves are the graphic representation of the palpable thrill.

3. *Exaggerated Pulmonary Artery Waves.* These are in accordance with the prominent and pulsatile pulmonary arc due to the increased pressure and volume of blood in the artery resulting from the shunt. The main branches of the pulmonary artery may also show exaggerated movement, corresponding to the hilar dance so often demonstrable radiologically.

4. *Exaggerated Upper Left Ventricular Waves.* These waves are similar to those seen in aortic regurgitation, which might be expected because of the opportunity for leakage of blood through the ductus in diastole, giving similar pressure relationships.

Anyone interested in kymography should see this article in the original.

Ten roentgenograms; 4 drawings.

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Interatrial Septal Defect. Richard S. Cosby and George C. Griffith. Am. Heart J. **38:** 80–89, July 1949.

Thirty-five cases of interatrial septal defect are analyzed, 16 studied clinically and 19 postmortem. Four of the antemortem cases later came to autopsy.

The findings in the postmortem series conformed in general to the previous pathologic concept of interatrial septal defect. Enlargement of the right side of the heart was predominant, but the left side was frequently affected as well, especially in the presence of hypertrophy of the right ventricle. The atrial septal defect averaged 2.0 to 7.0 cm. in diameter and was always more than 1.0 cm. The pulmonary vascular system was invariably affected to some degree, usually with gross dilatation and often with moderate atherosclerosis of the pulmonary vessels.

Symptoms are non-specific, the most common complaints being fatigue and shortness of breath. The salient physical signs are those of right ventricular enlargement (in the absence of mitral stenosis), with systolic and sometimes also a diastolic murmur. Complicating bacterial endocarditis is very rare.

X-ray examination shows enlargement of the right ventricle but the striking feature is the engorgement of the primary and secondary branches of the pulmonary vessels, which are seen fluoroscopically to pulsate markedly.

Cardiac angiography is not considered worth the risk and trouble involved. Cardiac catheterization, however, is regarded as a very helpful procedure since the right atrial blood shows an increased oxygen content and the left atrial pressure curve is appreciably higher than the right. If the catheter can be passed through the defect, the diagnosis is made.

It is difficult to abstract an article of this type because there is practically nothing one should leave out. The paper should be read in the original by anyone interested in the subject. It is unfortunate that no roentgenograms are reproduced.

Four tables.

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Tricuspid Atresia. Report of Two Cases of Young Infants, with Successful Operation. Benjamin M. Gasul, Egbert H. Fell, John J. Marino, and Carl B. Davis, Jr. Am. J. Dis. Child. **78:** 16–27, July 1949.

Two infants, one seven weeks old, weighing only 7 pounds 1 ounce, and the other six months of age, weighing 8 pounds 11 ounces on the day of operation, were carefully studied, and the diagnosis of tricuspid atresia with a pulmonary stenosis appeared certain. Both were desperately ill, extremely cyanotic and dyspneic even while in an oxygen tent. The enlargement of the left ventricle, shown by fluoroscopy and roentgenograms, and confirmed by the electrocardiogram, and the presence of a small right ventricle meant that pulmonary stenosis must also be present, since there cannot be a good pulmonary artery coming off a non-functioning or hypoplastic right ventricle. The pronounced concavity of the pulmonary conus in the anteroposterior and the right oblique views, and the unusually clear pulmonary fields without visible pulsations of the pulmonary vessels, as well as the wide and clear pulmonary window, pointed to this diagnosis.

Striking results followed anastomosis of the aorta to the pulmonary artery (Potts-Smith-Gibson operation. See J. A. M. A. **132:** 622, 1946), as shown by the disappearance of the visible cyanosis, dyspnea, and polycythemia, and by increased vigor in feeding and gain in weight. The clinical results achieved in these patients suggest that any cyanotic infant whose congenital malformation is amenable to surgical treatment, no matter how young and debilitated he may be, should not be allowed to die of anoxemia but should be given the benefit of a Potts-Smith-Gibson operation.

Thirteen illustrations, including 8 roentgenograms; 2 tables.

Transposition of the Aorta and Pulmonary Artery Demonstrated by Angiocardiography. J. F. Goodwin, R. Steiner, and E. J. Wayne. Brit. Heart J. **11:** 279–286, July 1949.

A single case of transposition of the aorta and pulmonary artery is presented, with excellent angiocardiograms clearly depicting the condition. The literature was reviewed and it was found that the longest survivals were those in which there was also an interventricular septal defect to allow some intermingling of the lesser and greater circulations. Still it is rare for a patient to live beyond four and a half years. The authors' patient is five years old and apparently has an associated septal defect. Though this was not shown radiographically, it was strongly suggested by rapid filling of the left side of the heart apparent on the two- and three-second films.

Five roentgenograms; electrocardiograms.

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Anomalous Right Pulmonary Vein Entering the Inferior Vena Cava: Two Cases Diagnosed During Life by Angiocardiography and Cardiac Catheterization. Charles T. Dotter, Norris M. Hardisty, and Israel Steinberg. Am. J. M. Sc. **218:** 31–36, July 1949.

The authors present 2 cases in which the drainage of pulmonary veins from the entire right lung into the inferior vena cava occurred. These cases were diagnosed during life with the aid of angiocardiography and cardiac catheterization. In each instance the clue to the ultimate diagnosis was supplied by abnormal shadows of an apparently vascular origin seen in conventional roentgenograms. The authors consider angiocardiography as the most valuable diagnostic measure, with the results of cardiac catheterization confirming the diagnosis.

The literature is reviewed and the pathologic physiology, anatomical findings, and treatment are briefly discussed.

Six roentgenograms.

DONALD S. CHILDS, JR., M.D.
The Mayo Foundation

Hypertensive and Ischæmic Heart Disease: A Comparative Clinical and Pathological Study. C. V. Harrison and Paul Wood. Brit. Heart J. **11:** 205–229, July 1949.

An intensive study of a small series of patients (42) with hypertensive and ischemic heart disease was made, with some rather interesting results. All cases were autopsied and the coronary arteries were injected with barium suspension at a pressure equal to the patient's last recorded diastolic blood pressure. The hearts were then studied radiographically, cleared, and photographed, and finally sections were made for microscopic study.

Patients were separated into the two groups by the presence or absence of angina pectoris and myocardial infarction. Any patient who had angina or infarction was considered ischemic regardless of the blood pressure; for inclusion in the hypertensive group, the blood pressure had to be more than 200/100. Any patient with hypertension who complained of angina or suffered a myocardial infarct was considered ischemic.

A number of important observations were made: (*a*) moderate degrees of atheroma do not necessarily cause narrowing of the lumen (in spite of the appearance on microscopic sections); (*b*) the coronary arteries enlarge in proportion as the myocardium hypertrophies; (*c*) the normal interstitial fibrous tissue also increases in amount as hypertrophy develops; (*d*) hypertensive

hearts have smooth, large coronary vessels, while ischemic hearts have narrow, irregular, and often occluded vessels; (*e*) the size and weight of the heart even in ischemic cases were closely correlated with the degree and duration of failure; (*f*) coronary occlusion can occur without infarction and infarction can occur in the apparent absence of occlusion (probably due to circulatory failure).

Hypertensive cases showed an even sex distribution, dyspnea, steady deterioration, retinal changes, cerebral symptoms, kidney damage, anemia, arrhythmias, left ventricular enlargement before onset of failure, and rarely an abrupt death. Ischemic cases predominated in men, and the women who were seen were considerably older than the men. They showed absence of the other features listed for hypertensive cases, with good temporary recovery after infarction but abrupt deaths.

Twelve illustrations including 4 roentgenograms; 5 tables.

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

THE DIGESTIVE SYSTEM

Radiologic Study of the Paradiaphragmatic Esophagus and of the Cardia. Albert Jutras, Paul Levrier, and Marcel Longtin. J. de radiol. et d'électrol. **30:** 373–416, 1949. (In French)

There has been great confusion in the roentgen diagnosis of lesions near the cardia. Three reasons for this are: (1) the relative infrequency of the lesions; (2) the fact that the area was considered inaccessible by surgeons until a few years ago; and (3) the dogma of the infallibility of esophagoscopy. The third reason is the least justifiable and the most pernicious. The esophagoscopist has access only to the mucosa, and then not always to the involved area; furthermore, he has no objective document of study. Ideally, the esophagoscopist and radiologist should complement each other in their studies.

The radiologic study of the esophagus should include study of (1) the silhouette; (2) peristalsis; (3) mucous membrane folds; (4) mucosal relief.

The patient is examined in the ventral and dorsal decubitus positions while swallowing the opaque medium. In addition, while the substance is in the stomach, a rubber tube is inserted and air is injected by syringe. After this, a thick opaque paste is swallowed for further study of the mucosal relief. The air aids in slowing further the already viscous paste. Serial spotfilms complement fluoroscopic study.

Statistics on 495 lesions in 25,000 examinations from 1943 to 1948 are presented. Diaphragmatic hernia, brachyesophagus, cardiospasm, diverticulum, esophagitis, ulcer, varices, and benign and malignant lesions of the esophagus and cardiac end of the stomach are discussed.

Seventy-one roentgenograms; drawings and photographs.

CHAS. NICE, M.D.
University of Minnesota

Obstruction of the Gastro-Oesophageal Junction. P. R. Allison. Lancet **2:** 91–94, July 16, 1949.

During a ten-year period, 507 cases of obstruction at the lower end of the esophagus were seen in the thoracic surgical department of the General Infirmary, Leeds. In 340 patients the obstruction was due to a malignant tumor (squamous carcinoma of esophagus, 184 cases; gastric adenocarcinoma, 156 cases). Among the remaining 167 cases, there were 1 case of leiomyoma, 60 of cardiospasm, and 106 of simple ulcer (gastric ulcer, 1; esophageal ulcer, 105).

Cardiospasm occurred largely in the age group twenty to forty, and was twice as common in females as in males. Peptic ulcer occurred chiefly in the age group fifty to seventy, and was very nearly as common in females as in males. Malignant obstruction of the cardia was found mostly between the ages of fifty and sixty, and was twice as common in males, whether the growth started in the esophagus or the stomach.

The main clinical features were dysphagia, regurgitation, loss of weight, anemia, and pain.

Cardiospasm: The roentgen findings in cardiospasm vary according to the stage of the disease at which the patient is examined. In the early stage there is contraction of the lower two-thirds of the esophagus, *i.e.*, from the region of the aortic arch downward, with a relative dilatation of the upper third of the esophagus. In the second stage, the lower two-thirds begins to dilate, but active movements, consisting of peristaltic waves and irregular local contractions, are noticed and contraction persists at the cardia. In the third stage, the diaphragmatic part of the esophagus remains contracted, while the part above is not only dilated but passive.

Peptic Ulcer: The radiologic appearances of peptic ulcer of the esophagus are described in detail elsewhere (Thorax **3:** 20, 1948). The condition is usually associated with sliding hernia of the stomach into the mediastinum, and this can be demonstrated if the patient is carefully screened in the Trendelenburg position with pressure exerted on the abdomen. The region of esophageal ulceration is immediately above the cardia, but there may be a centimeter of squamous epithelium between the lower border of the ulcer and the gastric mucosa.

Carcinoma: The roentgenologic appearance of carcinoma of the cardia may be considered under three main headings: carcinoma of the lower third of the esophagus, carcinoma astride the cardia, and gastric carcinoma. The primary esophageal lesion may appear as a local ulcer, a massive tumor in the lumen or in the mediastinum, an intermediate variety where there is a balance between new tissue formation and ulceration, or an extensive superficial ulceration. Growths astride the cardia may present as a smooth or irregular obstruction, and their origin cannot be determined radiologically. One of the most important of the gastric group starts in the stomach and grows up around the outside of the esophagus, causing a smooth funnel-shaped obstruction almost indistinguishable from cardiospasm In a second type of gastric carcinoma involving the cardia there is a horizontal deformity of the lower esophagus, with the barium taking a sharp horizontal turn into the stomach instead of passing obliquely. This is due to a mass on the lesser curvature pushing up the cardia. A massive tumor of the body of the stomach involving the cardia presents no difficulty. A fourth, rather rare, variety is the carcinoma of the gastric fundus occurring in a herniated stomach; the roentgen appearance may be that of a carcinoma of the lower end of the esophagus, but gastric rugae can often be demonstrated above the diaphragm. Esophagoscopy reveals an adenocarcinoma.

The esophagoscopic appearances and treatment of cardiospasm, carcinoma, and peptic ulcer are also discussed.

Four drawings.

A Consideration of Certain Sources of Error in the Positive Diagnosis of Gastric Carcinoma. Eddy D. Palmer. Am. J. Digest. Dis. **16:** 260–262, July 1949.

Zeal for increasing the surgical cure rate in carcinoma of the stomach by early operation must be balanced by the responsibility of abstaining from surgery on the normal stomach. It must be remembered that the smaller and earlier the lesion, the less is the certainty of diagnosis, and, although it may be true that some gastric lesions which are easily misdiagnosed as early cancer are best treated by surgery, diagnostic errors cannot be excused on such grounds.

The basis for this paper is a review of 28 cases which were studied at the Walter Reed Hospital by its diagnostic and surgical staff. All of these cases at one time or another were incorrectly diagnosed as carcinoma of the stomach. In 11 the error was discovered only at operation; in 17 the diagnosis was revised before resort to surgery. In each case the final diagnosis was rendered within a period of three weeks after admission to the hospital, frequently after repeated examinations. The average number of x-ray studies per patient was 2.9 and of gastroscopies 3.2.

The final diagnosis included hypertrophic gastritis in 12 cases, gastric ulcer in 6 cases, normal stomach in 5 cases, superficial gastritis of the antrum in 2 cases, and benign adenoma, gastric syphilis, and generalized hypertrophic gastritis in 1 case each. The antrum was the region most frequently involved in diagnostic error.

In the cases that went to surgery, the gastroscopist was found to have made the wrong diagnosis of carcinoma in 5 cases and the roentgenologist in 7; in 1 case both were in error.

One table. JOSEPH T. DANZER, M.D.
Oil City, Penna.

Hiatus Hernia and Carcinoma of the Stomach and Esophagus. Irving B. Brick. Gastroenterology **13:** 47–56, July 1949.

Analysis of 3,348 roentgen studies of the upper gastrointestinal tract revealed 308 hiatus hernias, or 8.93 per cent. In this group, carcinoma of the stomach occurred in 2 instances, or 0.65 per cent, while its over-all incidence was 2.9 per cent. A single case of esophageal carcinoma was found in conjunction with hernia. Five case reports are included, the 2 in which a gastric carcinoma was found associated with hernia, 2 in which carcinoma of the stomach was erroneously diagnosed in the presence of hernia, and the case of esophageal cancer and hiatus hernia.

A study of the literature indicates that gastric carcinomas in association with hiatus hernia more commonly involve the cardiac portion. No adequate explanation for the rarity of the combined lesions is offered.

Three tables. J. C. LORMAN, M.D.
Indiana University

Fluid in the Lesser Omental Sac as a Cause of Extra-Gastric Pressure Defect. Sol Glotzer. Gastroenterology **13:** 57–60, July 1949.

The lesser omental sac is a space formed by peritoneal reflections from the lesser curvature of the stomach to the under surface of the liver. It lies above and somewhat posterior to the stomach. The foramen of Winslow serves as its only communication with the greater sac or peritoneal cavity. This opening may become sealed off by exudate incident to inflammatory change in adjacent viscera with resulting distention of the sac by fluid. If present in sufficient amounts, fluid in the sac has a tendency to displace the stomach downward and to the left and to produce a smoothly curved concave pressure defect on the lesser curvature as shown by roentgenograms following ingestion of barium. The author describes two cases in which such a defect was demonstrated by barium meal studies. Autopsy, in the first case, revealed a perforated diverticulum of the sigmoid and a large amount of fluid in the lesser sac. No masses were found in the region of the lesser curvature. In the second case, a gangrenous but intact gallbladder was found at operation, and upon probing the foramen of Winslow, a gush of clear serous fluid was released from the lesser omental sac. No other lesion was found in the abdomen.

Two roentgenograms. WILLIAM C. GALLO, M.D.
Indiana University

Intestinal Obstruction Due to Ascaris. Samuel Skapinker. Brit. J. Surg. **37:** 110–111, July 1949.

A case is reported from South Africa in which a scout film of the abdomen showed two rounded worms in a dilated loop of jejunum and led to a diagnosis of intestinal obstruction due to Ascaris.

One roentgenogram.

Carcinoma of the Ascending Colon. Report of a Case. Richard S. Silvis. U. S. Nav. M. Bull. **49:** 692–698, July-August 1949.

A case of carcinoma of the ascending colon is presented to emphasize the importance of roentgen studies of the colon in patients with dyspepsia and vague right abdominal pain. If operation has been performed without previous roentgen examination, and if the pathologic findings do not account for the symptoms, studies of the colon should be carried out prior to the patient's discharge from the hospital.

In the case reported here, the patient's appendix was removed when he complained of severe abdominal pain and a twenty-pound weight loss, seven months before the correct diagnosis was made. A partial intestinal obstruction and peritonitis were found, but not appendicitis. No postoperative roentgenograms were taken. During the next three months, there were further weight loss, occasional constipation, and intermittent "gas pains." Physical examination indicated intestinal obstruction, and a scout film of the abdomen revealed several dilated loops of small bowel in the mid and right lower abdomen, and a few loops showing fluid levels. After the administration of a spinal anesthetic, tenderness and rigidity disappeared and a firm mass was palpable in the right mid-abdomen. A side-to-side ileo-transverse colostomy was performed, and when the patient's condition permitted, further studies were done.

A scout film of the abdomen revealed multiple calcified areas in the region of the tumor. Roentgenograms following a barium enema and a gastro-intestinal series indicated a mass containing multiple areas of calcification completely occluding the ascending colon. The inner margins of the lesion lacked the irregularity characteristic of carcinomatous lesions of the bowel. A right colectomy was performed, and 12 inches of the terminal ileum, the cecum and ascending colon, and the proximal third of the transverse colon, together with the regional lymph nodes, were removed. The histologic diagnosis was adenocarcinoma of the as-

cending colon, Grade 2. High-voltage roentgen therapy to the right and mid-abdomen was begun on the seventh postoperative day.

This case is noteworthy because the lesion, located 2 inches above the ileocecal valve and not impinging upon it, produced complete obstruction. Absence of anemia, the patient's age of 28, and the widespread calcium deposits in the tumor are somewhat unusual.

Three roentgenograms; 2 photomicrographs.

Radiologic Diagnosis of Epiplopericolitis. S. di Rienzo and Lidio G. Mosco. Prensa méd. argent. **36:** 1307–1311, July 15, 1949. (In Spanish)

The authors believe that the diagnosis of epiplopericolitis (tumefying epiploitis) would be made much more frequently if systematic roentgen examinations were carried out in all cases with a series of postoperative disturbances of an ill-defined character. The radiologic aspect is sufficiently typical to assure a correct diagnosis without laparotomy. It is the only diagnostic procedure capable of showing the characteristic findings.

The authors explain that the omentum, capable of great mobility, plays a decisive role in the evolution of an infective process in the abdominal viscera. Surgical traumatism, such as follows the removal of an actively diseased appendix, can initiate a process which the French school has called postappendicular extensive ascending epiplopericolitis; but simple surgical traumatism, such as removal of a healthy appendix, can set up a similar reaction. A foreign body, particularly a fish bone, can likewise set up an intense epiploic reaction in the colon. An inflammatory process involving the gallbladder, especially with gallstones, can cause the lesion in question, which may be called a "secondary epiploic reaction."

The condition must be differentiated from carcinoma of the colon. Epiplopericolitis presents a stenosis by edematous infiltration and cicatricial retraction. There is a definite discrepancy between the aspect of the bowel on oral opacification and that which is observed by the opaque enema. The area of stenosis is not sudden but gradual and reaches its maximum in the middle of the involved area. This is in contrast to the defect caused by carcinoma of the colon. With epiplopericolitis the lumen of the stenosed area is centrally placed and regular, whereas with neoplastic lesions it is not uniform. The stenosis is the result of external compression due to perivisceral reaction around the colon, thus giving rise to fundamental radiological signs: (1) conservation of the colonic mucosa, which in neoplasms is destroyed; (2) great discrepancy between the size of the filling defect seen radiologically and the palpable mass. To differentiate further between malignant and benign lesions, the authors inject pitressin—1 c.c.—which incites active peristalsis in the colon visible under the screen. With a neoplasm it is observed that the peristaltic waves are blocked near the tumor; whereas in epiplopericolitis peristalsis is normal in the stenosed sector and mucosal folds are also shown to be normal.

In other words, in epiplopericolitis there are radiologic signs of stenosis with apparent destruction of the colonic mucosa on oral examination, but on examination with the opaque enema or by the pharmacodynamic test with pitressin the mucosa is seen to be intact.

Ten roentgenograms. JAMES T. CASE, M.D.
Chicago, Ill.

The Value of Appendiceal Pain in the Roentgen Diagnosis of Chronic Appendicitis. P. C. Smyrniotis. Radiol. clin. **18:** 232–235, July 1949. (In French).

The author places considerable stress on the reliability of pain over the appendix in diagnosing chronic appendicitis. However, he maintains that a rigorous technic is necessary. On fluoroscopic examination of the ileocecal region following a barium meal, he manipulates and displaces the cecum and ascending colon in various positions. It is then necessary to determine whether the area of tenderness shifts with the displacement of the appendix or remains fixed in one position. Two surgically proved cases are presented.

Two roentgenograms; 4 diagrams.

E. M. SAVIGNAC, M.D.
Detroit, Mich.

New Elastic Fibers Formed in the Wall of the Gallbladder in Disease of the Gallbladder. Pathologic, Clinical and Roentgenologic Data Concerning a Hitherto Neglected Lesion. J. L. Riopelle. Arch. Path. **48:** 55–66, July 1949.

In the normal state the wall of the gallbladder is poor in elastic fibers, a fact which may explain why pathologists have apparently failed to investigate its morbid variations. Disease of the gallbladder, however, is often attended with slight or pronounced increases of parietal elastica.

The mean age at operation of patients with a high-grade increase of elastica is statistically higher than that of patients without such increase. The clinical duration is likewise significantly longer in the former. Roentgen examination reveals group differences between cases with and without increase of elastica, even if restricted to the study of the degree to which the radiopaque dye is concentrated in the gallbladder.

In 55 cases with no increase in elastica, visualization was normal in 23.6 per cent and weak in 42.8 per cent; in 23.6 per cent no shadow was visualized. In 43 cases with an increase in elastica of Grades 1, 2, and 3, visualization was normal in 9.3 per cent, weak in 46.5 per cent; in 44.2 per cent no shadow was visualized. In 40 cases with an increase in elastica of Grade 4, visualization was weak in 37.5 per cent and in 62.5 per cent no shadow was obtained. In another series of 56 consecutive cases in which the gallbladder was normally opaque and was removed for calculi soon after cholecystography, the elastica showed no increase in 85.7 per cent and an increase of Grades 1, 2, and 3 in 14.3 per cent. If there were no relation between increase of elastic tissue and cholecystographic results, the frequency of Grades 1, 2, and 3 should be about 40 per cent in the last series, that is, nearly thrice the observed figure. This is further proof of the relative incompatibility of increase of elastic fibers and good roentgenographic visualization.

The most probable hypothesis concerning the pathogenesis of the hyperplasia of elastic tissue is that it is of mechanical origin, due to a defective filling-emptying cycle of the viscus.

Five illustrations; 2 tables.

Observations on Biliary-Pancreatic Dynamics in a Normal Human. John D. Ryan, Henry Doubilet, and John H. Mulholland. Gastroenterology **13:** 1–8, July 1949.

Studies on the dynamics of the human biliary system were carried out upon a healthy 23-year-old male with a

fistula from an intrahepatic duct following a bullet wound to the liver. A 35 per cent diodrast solution was injected into an inflated Foley catheter placed in the fistulous tract, and roentgenograms were obtained, showing that the fistula connected with the right hepatic duct. Studies were then made to determine the effect of morphine, amyl nitrite, and hydrochloric acid.

After injection of 10 mg. of morphine sulfate subcutaneously, the gallbladder and terminal end of the pancreatic duct were visualized, but very little medium entered the duodenum. Immediately after this, amyl nitrite was inhaled and a prompt relaxation of the sphincter mechanism and gallbladder was noted. Instillation of hydrochloric acid into the duodenum caused spasm of the sphincter of Oddi, forcing diodrast (injected through the fistula) to enter the pancreatic duct. Morphine caused spasm of the duodenal wall as well.

Pressure readings by kymographic record of the intraductal pressure during fat digestion showed that even in the presence of spasm produced by hydrochloric acid the intraductal pressure did not rise to the level found in the absence of the gallbladder.

The authors reproduce six roentgenograms and five kymograms to show: (1) that observations on a normal extrahepatic biliary tract, following administration of morphine, amyl nitrite, and hydrochloric acid, were similar to findings in cholecystectomized patients with a T-tube in the common duct (see Doubilet and Mulholland: Ann. Surg. **128:** 609, 1948. Abst. in Radiology **53:** 453, 1949); (2) that the small variations in intraductal pressure in the normal human biliary tract correspond to previous observations on animals.

DAVID GASTINEAU, M.D.
Indiana University

Pancreatic Lithiasis and Gastritis (Cases with Gastroscopic Observations). Milton Machado Mourao and Rudolf Schindler. Ann. Int. Med. **31:** 83–95, July 1949.

Two cases of pancreatic lithiasis are reported in which a gastroscopic examination was performed, revealing superficial gastritis. This association prompted the authors to reconsider the etiology of pancreatic lithiasis and has led them to the conclusion that the two conditions may be due to a common factor, namely vitamin A deficiency.

A diet low in vitamin A is said to produce a tendency to inflammation and stone formation in the urinary tract in animals, and it is suggested that the same may be true of the pancreas. The deficiency may cause desquamation of the epithelium of the pancreatic ducts with subsequent infection and inflammation. The cellular desquamated elements may form a fibrillar network which would serve as a nucleus for calcium deposition. This would be favored by the alkaline reaction of the pancreatic secretion.

A triad of signs strongly suggests the presence of pancreatic lithiasis: (1) history of diabetes; (2) diarrhea, the stools showing microscopically the signs of pancreatic dysfunction, especially creatorrhea; (3) a roentgen picture revealing calcification in the region of the pancreas. Pain, weight loss (in spite of good appetite) and weakness, nausea, and vomiting may or may not be present. Additional objective findings are the lack of diminution of enzymes in the duodenal contents and a decrease of amylase in the blood.

The high calcium content of the pancreatic concretions makes their roentgen demonstration easy, and they may be discovered on the scout film. The stones usually have an irregular outline, being only rarely faceted. They are found most frequently in the region of the head of the pancreas, limited above by the upper border of the first lumbar vertebra and below by the lower level of the third lumbar vertebra. They must be differentiated from gallstones, kidney stones, and calcified lymph nodes. If multiple shadows are spread over the entire pancreas, no doubt about their nature will arise. If, however, a solitary shadow in the region of the head is seen, the differential diagnosis may be difficult. Cholecystography and pyelography may show the opaque shadows within or without the gallbladder or the kidney, respectively. Of great value for the recognition of a single pancreatic stone is its demonstration within the duodenal loop. This is best done by introducing a duodenal tube into the duodenum and then taking a film.

The paper concludes with a section on treatment. Two indications for surgery exist. Removal of a duct stone may not only eliminate pain attacks, but also stop progressive obstruction and fibrosis of the gland. If the pancreatic function is destroyed, surgery may still be undertaken for overwhelming pain. Pancreatectomy may be considered. Concomitant gastritis, enteritis, or gallbladder disease should be treated adequately.

Four roentgenograms; 1 photomicrograph.

STEPHEN N. TAGER, M.D.
Urbana, Ill.

Acute Pancreatitis Following Cholangiography. R. L. Zech. West J. Surg. **57:** 295–296, July 1949.

The author reports a case which he feels represents an acute pancreatitis due to obstruction of the common bile duct, with reflux into the pancreatic system during the injection of lipiodol for cholangiography.

The patient, a white male aged 65, had undergone a cholecystectomy and common duct exploration yielding many stones, but episodes of pain, jaundice, and acholic stools continued. One year following the initial surgery, the abdomen was re-entered and cholesterin debris and gravel were found in the common duct. On the tenth postoperative day cholangiography was performed, 20 c.c. of lipiodol being injected into the T-tube. Within ten minutes, nausea, vomiting, severe epigastric pain, pallor, and profuse sweating occurred. The blood pressure remained normal. These symptoms were thought to represent an acute pancreatitis. Serum amylase at this time was 484 units, rising within a few hours to about 540 units and subsequently dropping to 142 units. Roentgenograms made during the injection showed complete filling of the dilated common duct, reflux of lipiodol into the pancreatic system, and partial filling of the second portion of the duodenum. Apparently cholesterin debris was thought to remain and removal was effected by daily injections of nupercaine solution through the T-tube.

Two roentgenograms. R. R. SURRATT, M.D.
Baton Rouge, La.

THE MUSCULOSKELETAL SYSTEM

Eosinophilic Granuloma of Bone. B. Walthard and A. Zuppinger. Schweiz. med. Wchnschr. **79:** 618–623, July 9, 1949. (In German)

Eosinophilic granuloma of bone is a benign spontaneous granulation tissue growth inclining toward a

connective-tissue structure, which comes to notice through bone destruction, frequently with pain and loss of function. The condition favors male children and adolescents; it is multilocular in about a third of cases, and may involve any portion of the skeleton. The skull and ribs are common locations.

Roentgenologically eosinophilic granuloma is characterized by a rapidly developing osteolytic focus; sclerosis of the walls is absent, or at most minimal. Not uncommonly periosteal new bone formation is present. The diagnosis must be established histologically, the picture being characteristic. There are twelve important points: (1) a reticular groundwork; (2) eosinophils widely scattered or collected in clumps; (3) giant cells with 2 to 30 irregularly placed nuclei and phagocytosis (4) macrophages laden with nuclear fragments, eosinophils, and hemosiderin; (5) massive numbers of lymphocytes, plasma cells, and neutrophils; (6) small necrotic foci; (7) foci of hemorrhage; (8) numerous vessels, often thick-walled; (9) bone destruction with sequestration, periosteal bone formation, and osteogenic reaction with numerous osteoclasts; (10) Charcot-Leyden crystals, especially in the necrotic foci; (11) occasional foam cells, laden with neutral fat or rarely cholesterol; (12) transition from granulation to connective tissue is the direction of healing.

Individual foci heal following operative curettement of the contents. Radiation therapy also leads to healing. Radical surgical attack, especially in foci near a joint, is contraindicated. In cases with an unusual location, as the middle ear, the best results have been obtained with a combination of surgery and irradiation. There is a tendency toward recurrence, either locally or in a new location. Spontaneous regression of the lesions is possible, but it is not advisable to delay treatment in hope of this, while large defects leading to spontaneous fracture or severe functional damage may develop.

Eight case reports are included, with 18 roentgenograms, 5 photomicrographs, and 3 photographs.

LEWIS G. JACOBS, M.D.
Oakland, Calif.

Non-Specific (Eosinophilic) Granuloma of Bone. R. M. Hill. Brit. J. Surg. **37:** 69–76, July 1949.

The author presents the case of a 15-year-old boy who had a painless swelling of the right side of the forehead of three weeks duration, about 1 1/2 inches in diameter, fluctuant, and without thickening of the overlying skin. Roentgenograms showed a translucent area in the right frontal bone which was clearly defined, with no surrounding area of sclerosis. Aspiration was done and 2 c.c. of blood-tinged serous fluid was obtained. Microscopic examination of this revealed large numbers of leukocytes, of which 56 per cent were eosinophils. No organisms could be identified. Exhaustive x-ray studies of the skeleton showed no other abnormalities. The patient was then discharged and subsequently served in the British Army. Observations four years after the original examination showed the area of involvement to be almost completely restored by normal bone.

The histology and various possible etiologic agents in eosinophilic granuloma are considered somewhat in detail, and it is more or less concluded that the condition is due to a toxin, at present unspecified. The disease is primarily one of children and young adults, with a marked preponderance in males.

Eosinophilic granuloma is found more frequently as a single lesion and the membranous bones are the most frequently affected. Almost any bone can be involved, but apparently no cases have been reported in the small bones of the hands and wrists.

Clinically the manifestation of the disease depends largely upon the site of involvement. It may vary from a single local swelling, with or without pain, to severe degrees of constitutional disturbance, including lack of development and marked malnutrition. Nerve palsies have been recorded, but only a few examples of pathological fracture have been noted.

The characteristic roentgen appearance of eosinophilic granuloma of bone is an oval or circular translucent area. The margin is sharp and well defined, and there is rarely any surrounding sclerosis in the skull. Both tables are usually equally involved, and the suture lines do not limit extension. The lesion appears to commence in the marrow, and in the case of the ribs expansion of the cortex produces a fusiform enlargement. In the long bones, also, the cortex may be eroded and even perforated. Periosteal new bone formation is usually slight and appears to be confined to the lesions of the long bones.

The pathology of the lesions is described in rather great detail. The osseous lesions consist essentially of a cystic area, usually in the central portion of the bone. This is occupied by soft, hemorrhagic, or brownish granulation tissue, which may be streaked with yellow necrotic material. The supernatant fluid in the softer lesions may be clear or turbid, and microscopic study of aspirated fluid may show abundant eosinophil leukocytes.

The lesions must be differentiated from low-grade pyogenic osteomyelitis, syphilitic lesions, tuberculosis, Ewing's tumors, osteitis fibrosa cystica, myelomatosis, and other conditions.

The course is relatively benign, with no deaths being reported directly attributable to the disease. Treatment has largely been empirical on a rather vague basis. Radiotherapy, curettage, and excision, and combinations of these, have been employed. In some instances spontaneous recovery has been reported.

Six roentgenograms; 1 table.

J. D. CALHOUN, M.D.
University of Arkansas

Secondary Hæmangioma of Bone. Report of a Case. J. A. White. Brit. J. Surg. **37:** 114–116, July 1949.

A case of secondary hemangioma of the forearm associated with a similar contiguous soft-tissue condition is reported. The roentgenologic picture of these secondary hemangiomas differs from that of primary long-bone angioma. In the primary cases, the findings are: soap-bubble appearance; expansion of the bone in some cases; no phleboliths. The secondary cases show fine longitudinal striation and trabeculation; no differentiation between cortex and medulla; soft-tissue phleboliths.

Six illustrations, including 3 roentgenograms.

A Rare Case of Bone Dystrophy. John Halliday. Brit. J. Surg. **37:** 52–63, July 1949.

According to the author congenital bone dystrophies associated with unusual osteosclerosis may be grouped into four main groups: (1) Engelmann's disease (or

osteopathia hyperostotica sclerotisans multiplex infantilis); (2) osteopetrosis (or marble bones); (3) osteopœcilia (or spotted bones); (4) melorheostosis (Leri's disease, or Junghagen's monomeric eburneous osteosis).

A case is presented in great detail which does not fit, at least clinically, into any of the above groups. Certain of its features suggest leontiasis ossea, but the author believes it is best classified as a separate bone dystrophy.

The patient was a child who was first seen in January 1933 with failing vision and severe headaches. A roentgen study had been made two years earlier. At that time the skull showed a remarkable degree of thickening and sclerosis; the bones of the face, especially of the maxilla, were markedly involved; the ribs were widened and extremely dense and the clavicles were expanded and sclerotic; the cervical vertebrae were involved; the long bones were extraordinarily straight, the cortex was thinned, and the caliber of the bones was unusually uniform throughout their length, being much wider than normal in the mid-part of the shafts. Subsequent examination showed similar findings. The child died in May 1934, and the postmortem findings are fully described.

Five roentgenograms; 11 photographs.

E. S. KEREKES, M.D.
University of Arkansas

Masked Steatorrhœa Revealed by Pseudo-Fractures (Looser's Zones) with Some Observations on Calcium Excretion in Convalescence. J. R. Nassim and N. H. Martin. Brit. J. Surg. **37:** 63–68, July 1949.

The authors review the literature relative to so-called pseudo-fractures (Looser's zones, Milkman's disease, etc.) and present a case, nicely worked up, which they consider to represent a failure in fat absorption sufficient to produce incapacitating skeletal changes.

The patient was a young woman whose first complaint was pain in the feet. Radiologic examination showed generalized osteoporosis, with Looser's zones in the metatarsals and in the superior and inferior rami of the os pubis on the left side and the inferior ramus on the right side. There were small translucent areas, also, on the axillary borders of both scapulae. Laboratory studies showed findings typical of idiopathic steatorrhea. Following vitamin D therapy, the patient became free from pain and roentgenograms showed evidence of rapid recalcification, but fat and carbohydrate absorption were not markedly improved.

In their discussion of this case, the authors point out that failure in fat absorption adequate for the production of skeletal changes need not be associated with any gross irregularity of bowel action or grossly recognizable abnormality of stools. Failure to achieve calcification with normal therapeutic doses of vitamin D by mouth does not exclude steatorrhea, in their opinion, for it is in just such cases that an exceptionally high dosage may be needed to be effective.

It is suggested that a division be made between those cases of rickets which are clearly resistant to parenteral therapy and those which are resistant to oral therapy only. It is pointed out further that, in any obscure osteomalacia which may respond only to high dosage of vitamin D, resistance to this vitamin cannot be assumed unless steatorrhea has been excluded by examination of the stools.

Five roentgenograms; 2 photographs; 3 tables.

E. S. KEREKES, M.D.
University of Arkansas

Osteomyelitis Caused by Salmonella Paratyphi (Bacillus Paratyphosus A). Frederick E. Ludwig. Surgery **26:** 139–145, July 1949.

A case is reported which is of interest because of its etiology and because it was difficult to differentiate radiographically from an osteogenic sarcoma.

A 10-year-old girl complained of severe pain and swelling at the lower end of the femur after a fall in which she hurt her knee. About the same time she had had an enteritis of two days duration, with low-grade fever and a moderate leukocytosis. Blood culture showed gram-positive organisms. Roentgenograms revealed massive destruction of all anatomical layers at the lower end of the femur. Obvious new bone development suggested a malignant etiology in spite of the clinical picture. Operative exploration was done with preparation for mid-thigh amputation should osteogenic sarcoma be found. Frozen section study revealed instead an osteomyelitis with many sequestra and much early bone formation.

Gram-positive organisms were cleared from the blood by penicillin but gram-negative organisms persisted and were identified as paratyphoid A (*Salmonella paratyphi*). The gram-positive organisms proved to be *Staphylococcus aureus*. The mixed infection explained its more fulminating character. *Salmonella* infection alone is said to be of a more chronic and localized nature.

The case illustrates strikingly the caution required to differentiate atypical bone infections from malignant growth.

Six roentgenograms.

MORTIMER R. CAMIEL, M.D.
Brooklyn, N. Y.

Pathology of Neural-Arch Defects. A Dissection Study. Maurice B. Roche. J. Bone & Joint Surg. **31-A:** 529–537, July 1949.

The author was fortunate in obtaining for dissection the lumbar spine from the cadaver of a 44-year old man, in which roentgen studies had shown bilateral neural-arch defects in the fifth lumbar vertebra and a spondylolisthesis. The musculature was removed, the vertebrae were exposed, and the various bony elements were identified. A very minute dissection was made of the fifth lumbar vertebra, especially in the region of the isthmus on both sides. A description of the ligaments is presented and it is noted that they differ on the two sides. No definite fibrocartilage was found between the ends of the bone comprising the isthmus. It was noted particularly that the isthmus on the left side was entirely absent.

Six drawings; 1 photograph.

JOHN B. MCANENY, M.D.
Johnstown, Penna.

Constriction of the Intervertebral Foramen. A Cause of Nerve Root Pressure. Lee A. Hadley. J. A. M. A. **140:** 473–475, June 4, 1949.

The purpose of this paper is to focus attention on the "crossroads" between the peripheral nervous system and the movable skeletal support—the intervertebral foramen—as the site of nerve root pressure.

The intervertebral foramen is normally five to six times as large as the diameter of the nerve which passes through it. Physiologic constriction of the foramen by as much as one-third may occur with dorsal extension, lateral flexion, and rotation. Pathological changes in the structures forming the foramen will produce restriction of the "reserve cushion space," with consequent pressure on the nerve roots. The author mentions several such conditions:

(1) Osteoarthritis, with thinning of the disk, approximation of the pedicles, and decrease in the cephalocaudad diameter of the foramen. Spurs may project into the foramen, producing further constriction.
(2) A reverse spondylolisthesis, decreasing the anteroposterior diameter of the foramen.
(3) Hyperplasia or ossification of the ligamentum flavum.
(4) Bulging of the intervertebral disk backward and laterally into the foramen, usually at the fourth and fifth lumbar vertebrae. The nerve root is compressed against the upper pedicle and adhesions may occur about it.

Obviously myelography with the contrast medium within the dural sheath will not demonstrate nerve root pressure in the intervertebral foramen. Diagnosis depends upon clinical examination and roentgen studies of the foramina.

Treatment may involve rest alone, irradiation to the nerve roots, or surgical decompression of the intervertebral foramen.

Five illustrations, including gross specimens demonstrating encroachment of the foramen.

GABRIEL WHITEMAN, M.D.
Louisville, Ky.

Diagnosis and Repair of Pseudarthrosis of the Spine. Edgar L. Ralston and Walter A. L. Thompson. Surg., Gynec. & Obst. **89:** 37–42, July 1949.

In a one-year follow-up of 1,096 operations for spinal fusion performed at the New York Orthopedic Dispensary and Hospital during the ten years from 1936 to 1945, 182 cases of postoperative pseudarthrosis or fusion failure were encountered.

Pseudarthrosis should be suspected when sharply localized pain and tenderness persist over the site of attempted fusion postoperatively, or when the deformity or disease for which the operation was performed progresses. Roentgenographic confirmation is usually possible. Standard anteroposterior, lateral, and oblique projections may show the pseudarthrosis as a radiolucent line with adjacent osteosclerosis, but more reliable diagnostically are two lateral views with the spine placed first in maximum extension and then in maximum flexion. These films are compared, by superimposition, for differences in height of the intervertebral spaces and for variations in alignment of the anterior borders of the vertebral bodies. In addition, separation of the fusion plate may be seen on the flexion film.

In a few cases, definite diagnosis is not possible prior to surgical exploration. A procedure for the repair of pseudarthrosis by the use of bone chips, successful in 78.3 per cent of the authors' cases, is described.

Ten roentgenograms; 4 drawings; 1 table.

WILLIAM C. OWSLEY, JR., M.D.
University of Pennsylvania

Myelogram Following Operation for Herniated Disc. Folke Knutsson. Acta radiol. **32:** 60–65, July 31, 1949.

Myelograms following operation for herniated disks may not, in all cases, exhibit an entirely normal appearance. A total extirpation of the herniated disk may be difficult to accomplish owing to adhesions or other complicating factors, or the operation may be complicated by hemorrhage leading to cicatrization and adhesions. Subsequent myelography may present a deformation of the dural sac which may be extremely difficult to differentiate from renewed herniation.

The author presents three surgically proved cases in which postoperative myelograms suggested the possibility of reappearance of a herniated disk but which at subsequent operation showed only cicatrization.

As a result of this experience the author concludes that an entirely typical postoperative deformity arises following extirpation of the ligamentum flavum, which is carried out by the surgeon in order to approach the disk. The dural wall is adjacent to the ligamentum flavum and, on extirpation of the latter, shows a local hernia-like protrusion in the posterior-lateral area.

Fifteen roentgenograms. E. S. KEREKES, M.D.
University of Arkansas

Radiographic Evidence of Intermittent Protrusion of an Intervertebral Disc. C. C. Chatterton. Minnesota Med. **32:** 730, July 1949.

A case is reported in which a protruded intervertebral disk was clearly demonstrated when the patient experienced pain, on standing, but "normal myelographic findings" were obtained when she assumed the prone position. This particular patient had a spondylolisthesis and spondylolysis and this is believed to have contributed to the mobility of the protruded disk and thereby to the intermittent character of the symptoms. This appears to be a unique experience.

Two roentgenograms. S. F. THOMAS, M.D.
Palo Alto, Calif.

Diagnosis and Treatment of Carpal Injuries. George Cooper, Jr., and Charles J. Frankel. Virginia M. Monthly **76:** 336–339, July 1949.

The carpal bones most commonly involved in wrist injuries are the navicular and the semilunar.

Most fractures of the *navicular bone* are transverse and in the long axis. All fractures of the body are intra-articular and displacement is rare except when there is a complicating anterior dislocation of the lunate. Comminuted fractures of the navicular are rare. A fractured navicular is manifested by pain on the radial aspect, some swelling, and a weak and painful grip. Radiography, with multiple projections, is the only certain method of diagnosis. Oblique projections in semipronation and semisupination should be included. Treatment of displaced fractures consists of traction and immobilization. The cast should extend from the elbow to the metacarpal heads, including the proximal phalanx of the thumb, with the wrist in the position of function. Healing usually occurs in seven to ten weeks. Immobilization should be continued until there is x-ray evidence of union. This may take as long as six months.

Injuries of the *semilunar bone* are of two types: perilunar dislocation and rotation dislocation. In the first type the semilunar is in relatively normal position

but the distal carpals are displaced, as a rule backward and upward. In the second type dislocation is most often to the palm and, as the lunate is displaced, there is usually tearing of its ligament. If the anterior ligament is intact, it rotates forward and upward from 90 to 250 degrees. Clinical findings suggest the diagnosis in 75 per cent of the cases, but radiography is necessary for a final diagnosis. True lateral and anteroposterior views are suggested. Clinically the dislocated bone may be palpated, the palmar aspect of the wrist is altered, and the fingers are in slight flexion. Carpal motion is painful. Median nerve involvement may occur. Immediate manipulation is the treatment of choice but should be tried even in dislocations of several days duration. The wrist should be immobilized by an anterior splint from elbow to metacarpal heads, in 30 to 50 degrees of flexion. In four weeks the position is changed to slight flexion or neutral position, with two weeks more immobilization. The so-called "broomstick method" of reduction is condemned. Radiographic examination every four weeks for at least four months should be done to rule out aseptic necrosis.

Complications of navicular fractures may be delayed union, non-union, or aseptic necrosis. In addition there may be painful weak grip and traumatic arthritis. Aseptic necrosis of the semilunar often follows crushing injuries, but rough manipulation may also be a contributing factor. Delayed reduction may give rise to stiffness, fixed displacement, or loss of wrist and finger motion, as well as severe traumatic arthritis.

JOHN E. WHITELEATHER, M.D.
JOSEPH E. GARDNER, M.D.
Memphis, Tenn.

Fractures of the Distal End of the Radius Complicated by Fractures of the Carpal Scaphoid. O. D. Chrisman and J. H. Shortell. New England J. Med. **241:** 58–59, July 14, 1949.

This paper discusses the combination of a fracture at the distal end of the radius and fracture of the carpal scaphoid. In an analysis of 300 consecutive cases of fracture of the distal radius, 20, or 6.6 per cent, were found to have associated carpal fractures; 15 of these were fractures of the body of the scaphoid, 2 of the triquetrium, and 1 each of the lunate and the capitate and greater multangular. All these fractures resulted from a fall on the outstretched hand except one which was due to a blow.

It is most difficult to diagnose a fracture of the scaphoid complicating fracture of the distal radius, chiefly because of the distraction of the eye caused by the radial fracture. This study is a warning to examine the carpus more carefully.

The treatment of this combination of fractures is often difficult since maintenance of position is opposite in carpal fracture from that in fractures of the distal radius.

One roentgenogram. JOHN B. MCANENY, M.D.
Johnstown, Penna.

Evolution of Metaphyseal Fibrous Defects. Ignacio V. Ponseti and Barry Friedman. J. Bone & Joint Surg. **31-A:** 582–585, July 1949.

This article describes localized fibrotic change in the proximal end of the humerus first discovered, incidentally, at four years of age. At an earlier examination, at the age of two, the humerus had appeared normal. The bone defect was seen at the proximal end of the humeral diaphysis and one year later showed regression toward the center of the shaft. At five and one-half years, a second lesion appeared and, at the same time, the original lesion showed some fading. At six years, the second lesion was much larger and the first definitely smaller. At six and one-half years, the second lesion appeared to have progressed toward the center of the humerus and the original lesion was hardly perceptible. At nine years, the original lesion had completely disappeared, the second lesion was definitely fading, and a third lesion was making its appearance at about the same point at which the previous lesions had first appeared. Follow-up to the thirteenth year showed a gradual disappearance of all the lesions and maturation of the bone structure to normal appearance.

This study would tend to show that many of these fibrotic lesions will disappear of their own accord, being probably due to a disturbance in the process of ossification.

Fourteen roentgenograms.

JOHN B. MCANENY, M.D.
Johnstown, Penna

Congenital Dislocation of the Hip. Early Recognition and Treatment During the First Six Months of Life. Vernon L. Hart. Minnesota Med. **32:** 749–752, July 1949.

This paper, along with a motion picture, was presented before the Minnesota Academy of Medicine as part of an education program for the early recognition of dislocation of the hip.

If a dysplastic and inadequate hip forms during embryonic or fetal life, there are six possibilities for subsequent development of the joint: (*a*) The hip joint may spontaneously return to normal during intrauterine life or early infancy, with no treatment. (*b*) The dysplastic hip with only a flat socket may persist as such throughout life, with no displacement of the femoral head from the socket. (*c*) The femoral head may be partially displaced from the acetabulum as a subluxation which may persist as such. (*d*) Displacement of the femoral head may gradually increase from a partial to a complete displacement or dislocation. (*e*) Rarely, extreme dysplasia with irreparable malformation of all structures of the hip joint and marked shortening of the shaft of the femur develops.

Congenital subluxation is the precursor of dislocation. During the first six months of life dislocation is rare but subluxation is common. All clinical findings in this period are related to contracture of the adductor muscles of the hip; roentgen features are present and positive. The clinical and roentgen findings, which frequently are considered insignificant, may become major, permanent, and irreversible by the age of two or three years.

Since the dysplastic hip can be recognized during early infancy by clinical examination, every infant should have the advantage of this simple procedure. Routine mass x-ray studies of all newborn babies without clinical studies would create confusion, but coordinated clinical and roentgen studies of large groups of infants at birth and at several intervals during the first year of life should be encouraged. The first diagnosis should be a clinical diagnosis, and this should be confirmed or rejected by proper x-ray study.

The only "secret" to improve the results of treatment of congenital dislocation and subluxation of the hip is

early recognition and atraumatic treatment during the first six months of life, before weight-bearing. The use of the Frejka abduction pillow splint is advocated.

Three roentgenograms; 1 photograph; 1 drawing.

S. F. THOMAS, M.D.
Palo Alto, Calif.

Etiology of Trochanteric Fractures of the Femur. George N. Spears and J. T. Owen. J. Bone & Joint Surg. **31-A:** 548–552, July 1949.

The authors report an experimental study of fractures of the trochanteric region produced by mechanical means in femora obtained from healthy cadavers. The bone was held in the position normally assumed by an erect body and a definite known force was applied at the region of the greater trochanter. The group of femora were studied after the application of "stress-coat," a brittle lacquer that cracks on application of a static or dynamic load.

Roentgen studies of the unfractured bone revealed a definite pattern of trabeculae varying with the age of the individual. In the young adult the entire upper end of the femur appeared well mineralized, while with senility or debility the trabeculae were seen standing out against a less opaque background. In such cases careful examination showed a breaking up of the pattern, as if segments of the lamina were dissolved entirely. The lateral trabeculae are the first to be involved; eventually the medial group is also affected and the head of the femur becomes much less opaque to roentgen rays. These observations and the well known frequency of fractures through the trochanteric region in elderly people lead to the conclusion that the relative strength of the femur is decreased in this latter age group. Fracture lines have been shown to occur through the thinned-out trabeculae.

The "stresscoat" pattern in fractured bones showed a series of lines running perpendicular to the intertrochanteric region, indicating a tensile stress parallel to this ridge. It is suggested that tensile stress may be created parallel to the intertrochanteric ridge due to the so-called "arch-action" and that the actual break may be due to shear.

The fact that the fracture was shown to occur in the lateral trabeculae first and then to extend to the medial trabeculae is further substantiated by the behavior of the medial portion of the femur. It was shown by "stresscoat" to be subjected to an initial tensile strength and yet it appears to fail because of a compression-type load. This can be explained by a stress-reversal reaction, in which the arch of the neck tends to become straightened and elongated under the lateral load. Since both ends of the femur are restrained, the trochanteric portion of the medial trabeculae can fracture only by compression.

Five illustrations, including 2 roentgenograms.

JOHN B. MCANENY, M.D.
Johnstown, Penna.

Congenital Posterior Angulation of the Tibia. Clarence H. Heyman and Charles H. Herndon. J. Bone & Joint Surg. **31-A:** 571–580, July 1949.

Congenital bowing of the leg is uncommon and it has not been adequately described. Two types of anterior bowing have been generally recognized, one due to primary bone defect and the other apparently due to the shortening of the calf muscles. The authors add a third type, characterized by posterior angulation between the middle and lower thirds of the tibia with severe talipes calcaneus, tightening of the anterior muscles, a dimple over the apex of the angulation, shortening of the lower extremity, no evident abnormality of the bone structure, no impairment of the epiphysis, no abnormal tendency to fracture, and with a good prognosis. Three case reports are presented, two with a posterior angulation in the left leg and one in the right leg. They were discovered in the early weeks of life and all showed severe calcaneus deformity. The early treatment was conservative—massage, with later addition of a posterior brace extending from the toe to the groin with a leather cuff at the site of angulation, which could be tightened posteriorly. The patients all improved under this treatment and were able to walk at an early age. In all there was some residual shortening of the leg as compared with the normal mate.

Thirty-one roentgenograms.

JOHN B. MCANENY, M.D.
Johnstown, Penna.

THE BLOOD VESSELS

A New Method of Venography with Particular Reference to Its Use in Varicose Veins. H. D. Moore. Brit. J. Surg. **37:** 78–82, July 1949.

The author feels that the usual technics of venography in varicose vein evaluation are fundamentally unsound, because one thing which must be known for successful treatment is the site of those varicose veins which fill from the deep vessels. Injecting into the varicosities only shows where they empty; and the usual technic may or may not show the superficial veins, when a tourniquet is used on the ankle, as the outflow from the leg is too swift, and, without the tourniquet on the ankle, one does not know if the varicosity is filled from the deep vessels in the calf or thigh or directly from the superficial foot veins, even when connections can be seen between the superficial and deep systems.

If the deep veins are filled from the foot (the tourniquet at the ankle preventing the varicosities filling via the superficial vessels) and the flow arrested by a tourniquet at the groin, then it is certain that any superficial veins outlined are filled from the deep veins due to incompetent valves.

To obviate the rather troublesome and somewhat unreliable results of venography as commonly done, the author decided to try the effect of cutting off all blood flow in the limb with a view to pooling the contrast medium in the end veins and then washing it on as a bolus. To his surprise, the contrast medium did not remain in the foot and lower calf area but filled all the leg veins. Dilution by blood from the opposite limb was prevented by placing a tourniquet around the thigh of that limb, and the venous return from the pelvis and the limb injected was retarded by forced expiration just before the release of the tourniquet on the side being x-rayed. This procedure always gave a good film of the iliac veins and sometimes half or more of the inferior vena cava.

The difficulties and dangers inherent in the procedure are discussed, as well as the interpretation of the films.

Eight venograms.

E. S. KEREKES, M.D.
University of Arkansas

GYNECOLOGY AND OBSTETRICS

A New Contrast Medium for Hysterosalpingography. Bryan Williams. Lancet **2:** 151–152, July 23, 1949.

The author reports on the use of a new British contrast medium, Viskiosol Six, in hysterosalpingography. This medium contains 50 per cent of diodone in water with 6 per cent of polyvinyl alcohol added to give sufficient viscosity. It is non-irritating, and the diodone is absorbed rapidly. Being water soluble, it carries no risk of producing oil embolism. No complications so far have arisen from its use.

The shadows of the uterus and tubes with Viskiosol Six are not quite so dense as with iodized oil, and the latter is preferable if it is desired to show deformities of the uterus or filling defects. The appearance of the medium as it passes in a stream laterally from the tubes into the peritoneal cavity also differs from that of the characteristic fall of the globules of iodized oil.

Two roentgenograms.

X-Ray Visualization of the Placenta: Experiences with Soft-Tissue and Cystographic Techniques in the Diagnosis of Placenta Previa. Charles S. Stevenson. Am. J. Obst. & Gynec. **58:** 15–29, July 1949.

The author reports on a series of 488 pregnant women studied by x-ray procedures for localization of the placenta during the period 1945 through 1947. Of a total of 14,166 maternity cases seen during the period, 3 per cent had x-ray studies because of uterine bleeding, accounting for 432 of the cases. The others were examined because of persistent transverse or oblique position of the fetus in the last ten weeks of pregnancy. In 14 cases visualization of the placenta was not obtained, reducing the series for the purpose of this report to 474. In 87.3 per cent of these cases, a diagnosis "negative for placenta previa" was made correctly from the initial soft-tissue films, without difficulty.

In 60 cases, 12.7 per cent, further or more intensive studies were necessary. An incorrect positive diagnosis of placenta previa was made in 6 cases. False negative diagnoses were made in 3 of 10 cases which were proved to have marginal implantations of the placenta. No incorrect positive or negative diagnoses for complete placenta previa were made.

The technical factors used in the Boston Lying-In Hospital, from which this report comes, are: 75 to 82 kv.p., 100 ma., one to two seconds exposure, with a target-film distance of 40 inches. A Potter-Bucky grid is employed. The first film is taken with the patient lying on her side. If no placental shadow is seen, a second film is taken with the patient lying on the other side, or on her back if there is an indication that the placenta may be implanted laterally. Films are taken in the erect position if the fetal head appears to override the pelvic inlet.

Cystographic studies by injection of 100 to 200 c.c. of sodium iodide into the bladder are done in cases in which the placenta is not adequately demonstrated by the soft-tissue technic or if there is evidence of displacement of the fetal head suggestive of a possible placenta previa. An anteroposterior film is taken in the recumbent position, with a lateral film and views with the patient standing, as required.

A correctness of 95.3 per cent in the diagnosis of placenta previa was accomplished by the methods described. This figure represented a 100 per cent correct diagnostic achievement in cases of central placenta previa (21 cases), 100 per cent in partial placenta previa (8 cases), and 70 per cent in marginal placenta previa (10 cases). Considerable difficulty in localization of the placenta was experienced in cases of twins, marked hydramnios, and in normal pregnancies of less than twenty-seven weeks duration.

Six roentgenograms; 3 tables.

HARVEY J. THOMPSON, JR., M.D.
Jefferson Medical College

Sickle Cell Anemia and Pregnancy. George W. Anderson and Trent Busby. Am. J. Obst. & Gynec. **58:** 75–89, July 1949.

A review of 11 cases of sickle-cell anemia associated with pregnancy observed over a twenty-year period is presented. No deaths occurred in these cases during the course of pregnancy or the puerperium. The fetal mortality was 23.1 per cent.

The frequency of occurrence of sickle-cell anemia in the series seen by the authors was one in 1,296 pregnant Negro women. Repeated transfusions were necessary in the prenatal management of these cases. Three cases of toxemia of pregnancy were observed. No untoward effect on the sickle-cell process appeared to be produced by the pregnancy.

X-ray pelvimetric studies were done in only 4 of the 11 cases observed. Of these, 3 showed funnelling and anthropoid structure.

Thirty-three cases of sickle-cell anemia in association with pregnancy have been previously reported in the literature, with a maternal mortality rate of 21 per cent and a fetal mortality rate of 15.2 per cent. Addition of these 11 cases to the 33 previously reported alters the above percentages to 15.9 per cent maternal mortality and a fetal mortality of 16.6 per cent. Therapeutic abortion and sterilization are apparently seldom indicated in cases of sickle-cell anemia with associated pregnancy.

Six illustrations, including 4 roentgenograms; 4 tables.

HARVEY J. THOMPSON, JR., M.D.
Jefferson Medical College

Outlet Pelvimetry. Results in Measuring the Symphysis-Biparietal and Sacral-Biparietal Diameters in 145 Primiparous Women. Herbert Thoms and Charles B. Cheney. Surg., Gynec. & Obst. **89:** 67–68, July 1949.

The authors determine externally by a pelvimeter previously described (Surg., Gynec. & Obst. **83:** 399, 1946) the symphysis-biparietal distance and also the sacral-biparietal distance. The crossbar of the instrument measures 9 cm. in width, which, allowing 0.5 cm. for the soft tissues, represents an average biparietal diameter. To make the measurements, the cross bar is passed between the rami of the pubic bones and by upward pressure is brought as near the symphysis as possible. As the crossbar is held in this position, the end of the arm of the pelvimeter is brought to the lower edge of the symphysis and the symphysis-biparietal distance is read on the scale. With the crossbar still in position, the tip of the arm of the pelvimeter is swung posteriorly to rest externally over the tip of the sacrum. The sacral-biparietal distance is then determined from the scale after subtracting 1 cm., which represents the thickness of the sacrum.

Measurements were obtained in 145 primiparas. Of 113 with a symphysis-biparietal distance of 5 cm. or

less, 44 or 38.9 per cent were delivered by operation; of 32 with a symphysis-biparietal distance greater than 5.0 cm., 17 or 53.1 per cent required operative delivery. With this method the authors attempt to figure out the shape of the pubic arch and the subpubic angle. They consider that the measurements are useful adjuncts to roentgen pelvimetric procedures.

FRANCISCO CAMPOY, M.D.
University of Pennsylvania

THE GENITO-URINARY SYSTEM

Pyelography by Rapid Injection. Description of an Improved Method and Results in 200 Cases. Louis J. Friedman, Herbert Lobsenz, and Russell Jauernig. Am. J. Roentgenol. **62:** 84–90, July 1949.

Both "diodrast" and "neo-iopax" produce excellent, workable views of the urinary tract following intravenous injection. The purpose of the report is to present a method of injecting neo-iopax that almost entirely eliminates the characteristic arm pain. The authors believe that rapid intravenous injection, rather than the usual slow injection recommended by the manufacturers, is the method of choice. They also disregarded the contraindications listed by the manufacturers (severe liver disorders, nephritis, hyperthyroidism, etc.) and in a series of 200 consecutive unselected patients encountered no disquieting difficulties. To test for sensitivity, they merely inject 0.1 c.c. intravenously, leaving the syringe *in situ*. If no evidence of systemic reaction appears within thirty seconds, the injection is completed. In all patients, regardless of weight, with the exception of small children, 20 c.c. of 50 per cent neo-iopax are used. Intramuscular or subcutaneous injection of the medium is not recommended.

The interest of the authors lay particularly in the frequency with which clear-cut, definite arm pain was experienced by patients receiving the rapid injection. There were, in all, 10 out of 200 patients who described distress other than slight localized burning. The pain was felt, in most of these, in the shoulder rather than in the arm, or at least between the injection site and the shoulder. It was rarely severe, and special measures to combat it were not required. The authors used a 19 to 20 gauge needle and made the injection in one minute or less, preferably within thirty seconds, with the arm extended, perpendicular to the trunk.

The data on all the cases are tabulated, and an excellent bibliography is appended. There are no radiographs or illustrations.

E. S. KEREKES, M.D.
University of Arkansas

Parenchymal Carcinoma of the Kidney. I. H. Griffiths and A. C. Thackray. Brit. J. Urol. **21:** 128–151, June 1949.

One hundred and three cases of parenchymal carcinoma of the kidney are reviewed, with a discussion of the clinical features and their influence on the prognosis.

The plain film is of little assistance in making a diagnosis of carcinoma, though an enlarged or irregular kidney shadow may suggest the possibility and indicate the need for further investigation. Calcification in a renal tumor may be apparent, but this is a rare occurrence. It was seen in only 4 cases in the present series, and in 2 of these a misdiagnosis of calcified mesenteric cyst was made roentgenologically.

The information obtained by intravenous pyelography is in the authors' opinion of the greatest value in making a diagnosis, estimating function, and assessing the prognosis. There is no pyelogram that is typical or pathognomonic of renal carcinoma, nor can one classify the roentgen picture satisfactorily into the three descriptive types—spider, dragon, and carnation—favored by the German urologists. The usual picture, if excretory power is present, is one displaying distortion, distention, deformity, and filling defect of one or more of the calices or of the pelvis. If the ureter is seen to be deviated by a soft-tissue shadow, a retroperitoneal sarcoma or renal cyst should be seriously considered, but if the ureteric displacement is associated with a caliceal or pelvic deformity, the presence of a parenchymal renal tumor must be strongly suspected.

In the present series, 54 cases in which intravenous pyelography had been carried out were traced. In 39 of these, some alteration in the contour of the calices or the pelvis was observed, and in the remaining 15 there was no excretion on one side. In 10 of the latter group thrombosis of the renal vein was demonstrated at operation, while in the other 5 kidneys were rendered functionless by large, extensively necrotic tumors. Of the 15 cases with no excretion on pyelography, 1 was inoperable and 5 of the remaining 14 patients died shortly after operation. The immediate mortality in this group is markedly higher than in the general series.

Retrograde pyelography should always be done as a check on the intravenous pyelogram; in it the shadow is denser, the deformity, if present, is exaggerated, the outline of the calices may be more clearly defined, and the course of the ureter more easily traced.

The treatment of carcinoma of the kidney is primarily surgical. Nephrectomy was performed in 60 of the 103 cases; 20 cases were found to be inoperable, and operation was not considered in the remaining cases. Of 57 patients operated on a year or more earlier, 44 survived at the time of the report; 43 patients were operated on three or more years earlier and 24 of these were still alive. The survival rate for operable cases in this series compares favorably with results reported from the Mayo Clinic (Priestley: J. A. M. A. **113:** 902. 1939).

X-ray therapy was seldom used as a preoperative measure, and in only 1 case was the result at all impressive. Palliative deep therapy was given as a routine in the inoperable cases, but with no evidence of reduction of the rate of spread of the growth, though there did seem to be some alleviation or even complete relief of pain.

In only 10 of the 60 nephrectomy cases was deep x-ray therapy given to the renal area after operation. The number is considered too small to assess the value of postoperative irradiation. In a further 14 cases, local recurrences or metastases after nephrectomy were irradiated.

Eleven illustrations, including 2 roentgenograms; 12 tables.

Retrocaval Ureter. Robert Lich, Jr., and Owsley Grant. Arch. Surg. **59:** 84–91, July 1949.

Retrocaval ureter is a rare vascular anomaly in which the ureter completely encircles the vena cava on its way to the bladder. This report is said to be the thirty-seventh of the condition. [Two cases, presumably published since the completion of the present

paper, since the authors do not include them in their tabulation, are abstracted in RADIOLOGY for February and December 1949, respectively [(**52:** 299 and 901).—ed.] Subjective findings vary from those of a ureteral colic to intractable pyelonephritis and hematuria, but some patients are asymptomatic. The diagnostic criteria are five:

(*a*) In the lateral roentgenogram the ureter, instead of lying distinctly anterior to the vertebral column in the region of L-3 and L-4, is seen in close apposition to it. (*b*) Stereoscopic pyeloureterograms demonstrate the ureteral curve to be such as to include a structure having the diameter and position of the vena cava. (*c*) The ureter is displaced toward and generally overlies the midline in the region of L-3 and L-4. (*d*) The upper ureter presents a falciform curve, and if there is obstruction the ureterectasis ends abruptly at the medial portion of the curve as it comes down to overly L-3 or L-4. (*e*) The lesion is right-sided.

Nephrectomy is the usual treatment, but a plastic repair may be considered in the absence of renal damage.

One roentgenogram; 1 photograph; 1 table.

LEWIS G. JACOBS, M.D.
Oakland, Calif.

Ureteral Reflux in the Normal Child. H. M. Gibson. J. Urol. **62:** 40–43, July 1949.

Forty-three children of both sexes up to twelve years of age, having negative urines and no urological complaints, were studied cystographically. A suitable radiopaque medium was slowly injected into the bladder until the back pressure was sufficient to cause the plunger of the syringe to move backward. Roentgenograms were taken at this point; in some cases the catheter was removed first, but this had no bearing on the results. Two of the children, one male (13 months) and one female (16 months), showed ureteral reflux, filling the right kidney pelvis in each instance, indicating that ureteral reflux may occur in the presence of an apparently normal urological tract.

An incidental finding was the occurrence of vesical diverticula in 2 of the children.

Two roentgenograms.

HARRY PERLBERG, JR., M.D.
New York, N. Y.

Cystitis Emphysematosa: Case Report with a Review of Literature. Gerald H. Teasley. J. Urol. **62:** 48–51, July 1949.

Cystitis emphysematosa is usually an incidental finding at autopsy or on x-ray examination of the abdomen or pelvis. It is frequently associated with diabetes, E. coli infection, or a combination of the two. The recorded cases occurred in patients from 12 to 72 years of age and are equally distributed between the sexes. Instrumentation has frequently been incriminated as the etiological factor; but, in the absence of any manipulation both in the author's case and in some listed in the literature, it is believed that trauma from this cause is not necessarily a precursor.

On the roentgenogram, a ring of air shadows is seen to surround the bladder, changing position with distention of that organ. As seen through the cystoscope, the bladder mucosa appears shaggy or velvety, fiery red, and covered with innumerable small, transparent vesicles which rupture easily.

The author reviews the literature and adds his case, which he believes to be the seventh diagnosed antemortem, bringing the total number of reported cases up to 44. His patient, a 65-year-old white woman, had diabetes and an E. coli infection of the left kidney.

Three roentgenograms.

HARRY J. PERLBERG, Jr., M.D.
New York, N. Y.

Radiological Aspect of the Utriculus Prostaticus During Urethrocystography. Nils P. G. Edling. Acta radiol. **32:** 28–32, July 31, 1949.

When the para-mesonephric (müllerian) ducts atrophy in the male embryo, the fused caudal ends remain as the prostatic utricle (vagina masculina or virilis). The utricle forms a blind pouch in the midplane of the prostate, directed backward and upward from the opening on the collicle between the orifices of the ejaculatory ducts.

The author observed filling of the utricle in 17 of 700 male patients undergoing urethrocystography with water-soluble contrast media of the abrodil type. The cause of the visualization seemed to be a functional disturbance or post-inflammatory changes. In 29 normal subjects studied earlier, no utricular filling was obtained.

Contrast filling of the utricle in the course of urethrocystography does not seem to be of special diagnostic significance but its possibility should be borne in mind in the differential diagnosis of post-inflammatory prostatic cavities.

Five roentgenograms.

E. S. KEREKES, M.D.
University of Arkansas

TECHNIC

Development of the Tautograph and the Advantages of Automatization in Cardiovascular Angiography. Wendell G. Scott and Sherwood Moore. Am. J. Roentgenol. **62:** 33–43, July 1949.

The authors present a specially developed piece of equipment which produces a sequence of six to ten angiograms at one-second intervals to result in a continuous picture of a bolus of diodrast as it circulates through the chambers of the heart and lungs and into the aorta.

The device eliminates technician crews that are necessary for the operation of manual angiographic equipment. It achieves added clarity and contrast in the films by the use of a self-cocking Potter-Bucky grid. It completely automatizes the advance of the unexposed cassettes by the use of a chain conveyor system, the energizing of the Potter-Bucky grid, the initiating and ending of the roentgen-ray exposure, and the retiring of the exposed cassette. It allows taking the angiograms with the patient in the semi-erect or horizontal position. The exposure times are in the range of 1/15 to 1/20 of a second.

The authors go into considerable detail as to the technical aspects of the unit both from a mechanical and electrical point of view.

By means of this device angiocardiography becomes a practical technic in the diagnosis of congenital heart disease in infants and children. The unit has also been used with considerable advantage in cases requiring cerebral angiography.

Ten roentgenograms; 7 views of the tautograph.

E. S. KEREKES, M.D.
University of Arkansas

RADIOTHERAPY

What Further Contribution Can Radiology Make to Medicine? Chairman's Address. W. Walter Wasson. J. A. M. A. **140:** 133–135, May 14, 1949.

In this address, the Chairman of the Section on Radiology of the American Medical Association suggests progress in the field of radiology along the following lines: better knowledge for the selection and application of appropriate voltages in roentgen therapy; a better knowledge of tissue cell reactions and the pathologic changes in diseases to be treated; the use of radiation therapy in association with chemotherapy; the use of radioactive isotopes; newer radiographic technics, including the use of color; roentgen study of drug effects and the results of surgical treatment; roentgen study, over long periods, of chronic diseases and their life span.

Some Factors Influencing Response of Cancer to Radiation. Constance A. P. Wood. J. A. M. A. **140:** 513–518, June 11, 1949.

The author attributes to methods of accurate dosage measurement an important role in placing the radiation treatment of cancer on a scientific basis, citing instances from her own work in which these methods have been of assistance. As a result, it is no longer possible to ascribe failures in radiotherapy to an inability to deliver a predetermined dose of radiation to the tumor. The problem has now become one of radiobiology.

A study along these lines has been conducted by the Radiotherapeutic Research Unit of the Medical Research Council (London) in collaboration with Spear and Glucksman of the Strangeways Laboratory, Cambridge (Wood, C.A.P., and Boag, J. W.: Researches in Radiotherapy of the Oral Cavity. Medical Research Council, Special Report Series, His Majesty's Stationery Office, London). A brief outline of this work is presented. It involved serial biopsies made at intervals during irradiation for epithelioma of the oral cavity and indicates the importance of histologic studies in determining the response to treatment. Inability to produce differentiation was found to be one cause of failure and the persistence of precancerous lesions another.

It appears that entirely different treatment may be necessary for different types of epithelioma arising in the same site and that advancement in knowledge of the fundamentals of radiobiology leading to a better understanding of the action of radiation on the living cell offers the greatest possibility of any improvements in the radiotherapy of malignant disease.

Fourteen illustrations.

Present Status of Radio-Therapy and the Radio-Isotopes in the Treatment of Cancer. M. Weinbren. South African M. J. **23:** 566–576, July 9, 1949.

Recent advances in surgical technic, radiotherapeutic technics, and in the diagnosis of cancer do not alter the fact that only 25 per cent of patients who contract cancer can hope to be cured by x-ray, radium, or surgery, or their combination. In this challenging paper, the author reviews the present technics of cancer therapy and the statistics of leading world centers in each of the various types of the disease. The place of surgery and of radiation in the treatment of each is tabulated, and the role of radiation as a palliative agent is stressed.

One table. DONALD S. CHILDS, JR., M.D.
The Mayo Foundation

Contribution to the Study of Contact Roentgen Therapy. Jean De Backer. Radiol. clin. **18:** 235–239, July 1949. (In French)

The author merely mentions the pathologic conditions which he treats preferably by contact therapy. He uses a Philips tube at 50 kv.p. and 2 ma. The distance between the anticathode and the end of the tube is 18 mm., and the inherent filtration is equivalent to 0.2 mm. Al, to which supplementary filters of 1 mm. Al and 2.5 mm. Al may be added. The dosage rate is in the order of 10,000 r per minute.

The advantages over radium therapy are rapid treatment time in an ambulatory patient and the ease with which various forms of treatment localizers can be used.

The chief indications of contact therapy are the early cancerous and precancerous lesions of the skin, the true angiomata of the newborn, warts, and keloids. The method is particularly valuable in lesions of the eyelids and the lip. It has not been found to be of value in nevocarcinoma.

Dosage rates and schedules are mentioned.

E. M. SAVIGNAC, M.D.
Detroit, Michigan

Routine Management of Carcinoma of the Skin and Lips. Herbert L. Traenkle. New York State J. Med. **49:** 1659–1661, July 15, 1949.

The author presents a general outline of the treatment methods used in carcinoma of the skin and lips at the Roswell Park Memorial Institute (Buffalo, N. Y.). The majority of previously untreated malignant lesions are treated with roentgen rays, generated at 100 kv., with h.v.l. 1.5 mm. of aluminum and a target skin distance of 18 cm. In lesions requiring a field size of 1.5 cm. diameter or less, a single dose of 3,500 r (skin dose) is sometimes used. In most cases, however, and for all larger lesions, a protracted divided dosage is given, totaling 4,000 to 5,000 r administered over an eight- to twelve-day period. Lip lesions are routinely given a surface dose of 5,000 r in divided doses. For unusually bulky lesions 140- to 200-kv. roentgen rays are used.

Electrocoagulation is used in very small epitheliomas and in lesions recurring in a previously irradiated area, where further irradiation is not advisable. The electrocautery is used in lesions involving the rim of the ear.

Surgical excision and repair are performed in all but the smallest recurrent epitheliomas where irradiation has been previously used. Surgery is also the procedure of choice in large epitheliomas situated on the forehead, scalp, dorsum of the hand, or below the knee. Bulky epitheliomas of the lip or epitheliomas of the lip surrounded by leukoplakia are best treated by surgical excision.

The routine of follow-up examinations is outlined.

The treatment of metastases from cutaneous and lip cancer is felt to be a separate problem and is not dealt with in this paper. DONALD S. CHILDS, JR., M.D.
The Mayo Clinic

Roentgentherapy in Cancer of the Hypopharynx. François Baclesse. J. A. M. A. **140:** 525–529, June 11, 1949.

The prognosis for cancer of the hypopharynx is poor because tumors in this site are usually of an ulcerating and destructive nature. Complications, such as infection, involvement of the cartilage, and sometimes con-

siderable extension to the surrounding structures, make these lesions difficult to cure. They are classified anatomically into two groups: (1) cancers of the upper part of the hypopharynx, including epitheliomas of the aryepiglottic fold and the anterosuperior part of the pharyngolaryngeal fold, which can be cured when they are proliferative, and (2) cancers of the lower part, including those deep in the pyriform sinus, lesions involving the posteropharyngeal area of the arytenoid and the cricoid, and the mouth of the esophagus, or the posterior wall of the hypopharynx. These are much more difficult to cure and are practically incurable when they are ulcerating.

In early cases the diagnosis is easy but in advanced cases, laryngoscopic examination is the only way to determine the origin of the disease. This procedure should be carried out during and at the end of treatment, after partial or total regression of the tumor.

Anteroposterior and lateral films of the neck to show the pharynx may reveal three radiographic signs which point to the diagnosis of tumor of the upper part of the hypopharynx: (1) The space between the hyoid bone and the superior border of the thyroid cartilage, ordinarily clear, shows a shadow of increased density due to tumor. (2) The superior thyroid horns are not pushed forward; they remain in contact with the cervical part of the spine. (3) The flexibility of the pharyngeal wall is preserved. In the Valsalva test, the thyroid and cricoid cartilages are pushed forward and the lumen of the hypopharynx above the level of the superior half of the cricoid becomes dilated.

The radiographic signs of cancer arising in the lower part of the hypopharynx are: (1) The posterior pharyngolaryngeal shadow is thickened in its superior arytenoid segment or in the inferior cricoid part, or in both. (2) The superior thyroid horns, and occasionally the cricoid, are pushed forward. (3) Flexibility of the pharyngeal wall is observed to be decreased in the Valsalva test. However, some normal patients are unable to distend the hypopharynx with air.

The degree of flexibility is better demonstrated if the roentgenogram is taken immediately after oral administration of barium sulfate. The details of the lower part of the pharyngeal "funnel" are outlined by the opaque medium.

Clinical and radiographic studies of 240 patients treated during a ten-year period revealed 70 cancers of the upper part of the hypopharynx, 100 of the lower part (of which 11 arose in the cricoid region), and 52 of the posterior part. Eighteen tumors were not classified because they were too extensive, treatment not completed, etc.

From 1921 to 1942, 425 patients were treated for cancer of the hypopharynx at the Curie Foundation. Of this number, 27 (6 per cent) were living and apparently healed after five years.

The best results were obtained during the years 1932 and 1933, when of 8 patients treated, 4 were alive and apparently cured after five years. These patients later died from a second cancer (not recurrence *in situ*). Doses given in these cases were high (total skin dose distributed over two fields, 7,000 to 9,100 r) and over a relatively short period, sixteen to forty-five days. Moreover, treatment was delivered through large fields, 100 sq. cm. or more. All these patients except the one treated over the forty-five day period had severe reactions, *i.e.*, cutaneous changes and muscular and deep tissue sclerosis.

In contrast, the 7 surviving patients treated from 1937 to 1942 had no post-irradiation complications and, so far, have shown no second cancer in the irradiated area. These patients received doses sometimes higher but over a longer period (from sixty to seventy-four days) and through much smaller fields (10 to 50 sq. cm.).

During the last ten years, technic in the radiotherapy department of the Curie Foundation has been directed in the following manner. Attempts are made to avoid exudative reactions. Mucous membrane reaction, when it is produced, should be mild so that treatment may be continued. If more or less intense reaction is produced in spite of measures to prevent it, treatment is stopped temporarily to that area for the duration of this reaction. In the meantime, irradiation is continued to the lymph nodes through tangential fields which avoid the pharynx.

The total skin dose per field is increased considerably over the generally accepted limits. This increase is possible only when two conditions are observed: First, the size of the field must be reduced after a certain dose and the lymph nodes irradiated tangentially. Second, the fractionation must be prolonged beyond the period of four to six weeks which is now used by most radiotherapists.

Two illustrations; 4 tables.

Cushing's Disease—Pituitary Basophilism. Caldwell Lecture, 1947. Merrill C. Sosman. Am. J. Roentgenol. **62:** 1–32, July 1949.

In his opening remarks, the author reviews the accomplishments of Dr. Harvey Cushing and other investigators who have been interested in the problem of pituitary disease. He divides pituitary tumors into two main groups: craniopharyngiomas, which are congenital cysts arising from a remnant of Rathke's pouch, usually occupying a suprasellar position, and the adenomas. The craniopharyngiomas are usually responsible for the condition described as Fröhlich's syndrome.

The pituitary adenomas are of three main types, classified on the basis of their histopathological appearance. The first of these is the chromophobe adenoma, which formed 70 per cent of Cushing's large series (338 verified cases) of adenomas. These tumors arise from the chromophobe cells, which have no known secretory function, and produce symptoms by compression of the remaining pituitary gland and neighboring structures. Classical hypopituitary symptoms are present, as amenorrhea or impotence, sluggishness, sensitivity to cold, thin fine hair, thin dry skin, etc. Hypothalamic and optic chiasmal pressure symptoms are also present.

The second type of pituitary adenoma is the acidophilic, which formed about 20 per cent of Cushing's series. It arises from the coarsely granular eosin-staining cells. The symptoms are those of hyperpituitarism, chiefly of the growth factor, with gigantism in young persons and acromegaly in adults. Mixed chromophobe and acidophil adenomas usually present hyperpituitary symptoms at first but later show hypopituitary symptoms.

About 80 per cent of the chromophobe adenomas respond to irradiation. It is difficult to assay the effect of irradiation on acidophil tumors, but headache, frequently the most distressing symptom, is relieved in about 90 per cent of cases.

Basophilic adenomas, the third type, are rare. Such

tumors produce the most bizarre and complex signs and symptoms of polyglandular dyscrasias. Any of these signs or symptoms may be absent in an individual patient or of delayed appearance, and no one symptom or group of symptoms is essential to the syndrome.

The endocrinology of the pituitary gland and the pituitary-adrenal mechanisms and the pathologic physiology of Cushing's disease are considered at length and the author presents the attempts of many investigators to give the entity a single, sound etiological foundation. These discussions are too lengthy to present here. Suffice it to quote the author: "Whatever the cause may be, and it is safe to say that at the present time no single cause has been found, the syndrome is still a distinct and definite one, even though there are variations in some clinical features, discrepancies in the laboratory and autopsy findings, and no universal satisfactory method of treatment."

Laboratory findings are variable, but urinary hormone assays, the uric acid-creatinine ratio, the adrenocorticotropic hormone test and adrenalin test, and the absolute level of circulating eosinophil determinations are all of probable diagnostic value. X-ray studies are also of great diagnostic value. The majority of cases show osteoporosis, more marked in the skull, spine, pelvis, and ribs, with the extremities spared. There is frequently a granular mottling in the skull, but the sella is usually normal. The ribs frequently show multiple fractures with excessive callus. Abdominal films may reveal adrenal tumors.

No form of treatment seems to give uniformly good results. So far attempts have been made with irradiation of the pituitary region, irradiation of the adrenal areas, partial adrenalectomy, administration of estrogens or androgens, either singly or together, and occasionally direct surgical attack on the pituitary gland. Various diets have been suggested. It is very difficult to evaluate modality because of the tendency of the disease to spontaneous remission. It seems now that the most lasting remissions are obtained with roentgen irradiation of the pituitary region. The exact dosage, quality, and time scale are uncertain, because variation in responses, both temporary and lasting; with variable doses, both large and small, have been reported.

The author presents summaries of 7 cases, 18 illustrations, including 3 roentgenograms, and 2 tables.

JOSEPH D. CALHOUN, M.D.
University of Arkansas

Radiosensitization of Thyroid Epitheliomas by Amino-thiazol. M. Dargent, J. Papillon, and P. Guinet. J. de radiol. et d'électrol. **30:** 15–21, 1949. (In French)

The authors review the varying radiosensitivities of different forms of malignant tumors of the thyroid gland as gleaned from both the literature and their own experience. This report deals with the attempt to increase the radiosensitivity of carcinoma of the thyroid by the administration of synthetic antithyroid substances. Their working hypothesis supposed an increased radiosensitivity to ionized radiation when tissue undergoing "malignant hyperplasia" was influenced by one of the thiouracil derivatives.

The publication is essentially a report of 6 patients with carcinoma of the thyroid, in 2 of whom there were associated signs of hyperthyroidism. All patients exhibited either postoperative or postirradiation metastases of previously existing malignant tumors of the thyroid gland. Treatment consisted in the administration of amino-thiazol in association with radiation therapy. The latter was given with 200 kv., filtration 1 mm. copper. The local dose (presumably measured on the skin) varied between 2,700 and 4,200 r depending upon the particular focus.

The authors describe a more rapid response to irradiation than had been their experience with radiation therapy without associated administration of thyroid-stimulating medication. In 3 of the 6 patients they had had an earlier opportunity to treat metastatic foci by roentgen therapy alone not associated with any thyroid medication. They believe that their observations indicate a more marked radiosensitivity when the two agents are combined.

SIMEON T. CANTRIL, M.D.
Seattle, Wash.

Treatment of Cancer of the Breast (Halsted Amputation, Radium Seeding, Radium-Bearing Corset; Personal Method). A. Jentzer and R. Clerc. Schweiz. med. Wchnschr. **79:** 537–539, June 18, 1949. (In French)

The authors supplement the classical Halsted operation by radium seed insertion into all areas suspected of cancer at operation; they give their mean dose as 20 mcd. Fifteen days later, a plastic moulage, 200 sq. cm. in area and containing 200 mg. of radium arranged mostly at the periphery to obtain a homogenous distribution of the dose, is applied to the thorax. The distance from the skin is 4 cm. A dose of 220–300 mcd., depending on the size of the thorax, is given. The result is an exudative reaction.

In the ten years they have employed this method, the authors have treated 61 cases, but of these only 25 have been followed five or more years. Cures were obtained in 13 of 15 cases in Stage 1, in 4 of 8 in Stage 2, and in 1 of 2 in Stage 3, the over-all cure rate being 72 per cent. Edema of the arm developed in 3 patients, and in 65 per cent some degree of pulmonary fibrosis was later demonstrated.

Dr Gilbert of Geneva, who discussed this paper, felt that there was some doubt of the validity of the method, but after a personal review of the records he had agreed to collaborate in increasing the size of the series to 100 five-year cases for better evaluation.

Five illustrations, 3 tables.

LEWIS G. JACOBS, M.D.
Oakland, Calif.

Use of Interstitial Radon Seeds and Needles in Inoperable Lung Cancer. Irving M. Ariel, Jerome R. Head, Hiram T. Langston, and Edward E. Avery. Cancer **2:** 581–586, July 1949.

In a recent analysis of the efficacy of the various modalities of therapy for lung cancer at the Veterans Administration Hospital, Hines, Ill., it was observed that in only 49 of 1,205 patients with primary carcinoma of the lung could surgical resection be carried out. With improvements in technics of chest surgery, more exploratory thoracotomies are being performed, and increased numbers of inoperable neoplasms are being visualized directly. This report is based on 17 cases of inoperable bronchogenic carcinoma which were treated by interstitial radon seeds at the time of the exploratory thoracotomy.

Three types of gold seeds and needles were used. The

active lengths were 1, 2, and 4 cm., with a diameter of 0.7 mm. and a wall 0.3 mm. thick. They contained an average of 1, 2, and 4 mc. of radon, respectively. The plan was to surround the lesion with the large needles and disperse the smaller tubes and seeds throughout the neoplasm according to the distribution proposed by Quimby. Accurate distribution was frequently difficult because of the proximity of the neoplasm to vital structures and the difficulty of determining its exact extent. The seeds and needles were left permanently in place. An attempt was made to provide 6 to 10 threshold erythema doses to all parts of the lesion. Total dosages varying from 2,660 to 15,864 mc. hr. were employed.

The presence of radon had no deleterious effect upon the convalescence of any patient. Each enjoyed an essentially uneventful postoperative course, entirely comparable to that of non-irradiated patients. One brisk skin reaction was noted. Each patient enjoyed prompt palliation with decrease of cough and expectoration, relief of fever, and improved appetite. However, the therapy did not influence significantly the length of survival. Sixteen of the 17 patients succumbed to the disease at an average of 5.6 months following insertion of the radon. One patient is alive and asymptomatic ten months following therapy.

One table, summarizing the 17 cases; 3 roentgenograms; 1 photograph.

DONALD S. CHILDS, JR., M.D.
The Mayo Foundation

Surgical Intervention in Recurrent and in "Radioresistant" Cancer of the Uterine Cervix. J. Heyman and B. Belonoschkin. Acta chir. Scandinav. **98:** 489–496, 1949.

At the Radiumhemmet, Stockholm, cancer of the uterine cervix is treated with radium and roentgen rays, the radium being considered the most important. Surgery is used only in the event of failure of irradiation, under either of the following circumstances: (*a*) local recurrence following primary healing by radiotherapy, and (*b*) failure of response to radiotherapy, *i.e.*, the so-called radioresistant cancer. A case is classified as a local recurrence if a fresh local lesion develops after freedom from evidence of disease has been demonstrated by repeated examinations for six or more months. Two types of cases are classified as radioresistant: (1) small primary lesions remaining macroscopically unchanged following a complete course of irradiation and (2) more extensive growths which do not disappear even though markedly diminishing.

During the period 1914 to June 1947, 136 of a total of 6,302 cases of primary cervical cancer were submitted to hysterectomy or to an exploratory laparotomy for one of the two reasons given above. For the 69 cases in which operation was done because of local recurrence, the five-year cure rate was 29.1 per cent; at the time of operation the cancer had spread outside the uterus in 30.6 per cent of this group. For the 67 "radioresistant" cases, the five-year cure rate was 12.1 per cent; and in 44.7 per cent of this group the cancer had spread outside the uterus at the time of operation.

The observations made at operation and the difference in the results obtained in the two series indicate that the so-called radioresistant cases are of a more malignant character than those with local recurrence. Attention is drawn to the possibility of "radioresistance" being synonymous with incurability whatever the method of treatment used.

Symposium: Carcinoma of the Bladder. I. Treatment of Cancer of the Bladder by Radium. Arthur Jacobs. **II. Some Further Aspects of Treatment.** E. W. Riches. **III. Treatment by Radon Seed Implantation and Deep X-Ray Therapy.** J. L. E. Millen. Brit. J. Radiol. **22:** 393–405, July 1949.

Jacobs briefly reviews the available methods of treatment for carcinoma of the bladder, pointing out the limited usefulness of partial and total cystectomy. The technic of radium implantation following the Paterson-Parker distribution system is described. Post-irradiation reactions are not severe except in extensive cases. Of 110 patients treated by this method, 11 died from the operation, 52 died within the first five years of bladder cancer, 10 died of intercurrent disease, and 37 survived five years or longer.

Nine illustrations, including 6 roentgenograms; 2 tables.

Riches points out the great variety in size, shape, location and character of bladder tumors, making each case an individual problem. Many cases will do best with some combination of surgery, surgical diathermy, radon or radium, and x-ray. Surgical diathermy may keep a growth in check for long periods of time when more vigorous methods are contraindicated by age or other factors. Roentgen irradiation will check bleeding, but probably never cured a case. Radium and radon implantations are often effective in smaller growths but are apt to fail or cause severe sequelae in larger ones.

Partial cystectomy was used in about 30 per cent of the Riches' cases. Among 46 so treated, there were 7 operative deaths (15.2 per cent) and 10 five-year survivals (21.7 per cent). Of 31 patients treated by total cystectomy, 4 died as a result of the operation, 20 died within two years, and 7 lived between two and three years. Of 14 treated by transplantation of the ureters plus x-ray therapy, 3 died from the operation and 4 lived from six months to two years.

Three illustrations.

Millen, discussing radon implantation, points out that a circle 7 cm. in diameter is about the maximum that can be effectively treated, and that growths thicker than 1 cm. cannot be well handled. Within those limits, radon implantation is the method of choice. Of 55 patients with non-infiltrating tumors so treated, 60 per cent survived five years, as did 15 per cent of 39 patients with infiltrating lesions.

Tumors beyond the scope of treatment by implantation received multiple-field roentgen irradiation, with a tumor dose of 6,000 r in five weeks. The five-year survivals in this group of patients were: for 30 with non-infiltrating growths, 23 per cent; for 44 with infiltration, 7 per cent.

Fifty-four patients received other forms of radical irradiation, with 11 per cent five-year survivals. Twenty-seven were given palliative roentgen therapy, with an average survival of four months.

Three tables.

SYDNEY J. HAWLEY, M.D.
Seattle, Wash.

Implanter for Radon Seeds for Use with the McCarthy Foroblique Pan-Endoscope. J. Robt. Rinker. J. Urol. **62:** 91, July 1949.

An implanter for radon seeds, so modified that the shaft is rigid and can be used with the McCarthy Foroblique Pan-Endoscope, is described. The author states that with this instrument the seeds can be im-

planted with greater ease, accuracy, and speed in that portion of the bladder which is accessible through the Pan-Endoscope.

One illustration.

The Leukemias. The Actual Position of Radiotherapy. P. Marquès and P. Bétoulières. J. de radiol. et d'électrol. **30:** 417–446, 1949. (In French)

This report discusses hematopoiesis, diagnostic and other clinical aspects of the leukemias, the action of irradiation on the blood and hematopoietic organs in general, the diverse means of treatment, both radiotherapeutic and non-radiotherapeutic, and the results. It also includes an extensive bibliography.

From 1933 to 1939 a series of experiments on dogs was undertaken to study the action of radiation on the blood and hematopoietic organs. Total roentgen therapy for a dose of 500 r led to death in fifteen to twenty days, as a result of a hemorrhagic syndrome. The leukocytes, especially the lymphocytes, decreased to a state of extreme leukopenia. Red cells, hemoglobin, thrombocytes, and reticulocytes decreased. The sedimentation rate increased. No effect was noted on blood sugar, cholesterol, urea, non-protein nitrogen, or on cell fragility.

A protracted dose of total roentgen therapy (amount not given) provoked an increase in the elements of the blood, followed by a progressive diminution. For death of the animal an increased dosage was required as the time of protraction increased.

A very weak dose of total roentgen therapy had the opposite effect. The leukocyte count remained more stable. Neutrophils, eosinophils, reticulocytes, and thrombocytes increased. Coagulation time decreased. Subtotal irradiation (protection of the sternum or of extremities) led to the same changes as total irradiation but these were less marked and regeneration appeared sooner. Local irradiation produced leukopenia and anemia, usually slight and not lasting.

It is difficult to dissociate the action of x-rays on the circulating blood from the effect on the hematopoietic organs, which include the bone marrow, spleen, lymph nodes, and the diffuse reticulo-endothelial tissue. *In vitro*, radiations do not affect the blood elements or the physico-chemical constants of the blood. *In vivo* experiments by Ducuing and his associates revealed no direct effect on the circulating blood of the animal extremities. However, in cases of radiosensitive leukemias or lymphosarcoma, localized irradiation may result in the diminution of a tumoral mass not directly treated, and the injection of blood from an irradiated animal into a fresh animal produces a leukopenia. The circulating blood may then transport leukolysins or some other ill-defined substance, which is capable of acting at a distance.

The action of irradiation on the spleen, tonsils, and thymus is very rapid. A few hours after a large dose the nuclear structure is altered; then, little by little, the altered elements are engulfed by phagocytes. After twenty-four hours, the majority of the cells are destroyed. In myeloid tissue the response is slower, the red cells being less sensitive than the white cells. Three days were necessary to depopulate the bone marrow considerably, and the process required twelve days for completion. The reticulo-endothelial system seemed to be less sensitive than lymphoid and myeloid tissue.

The spleen does not appear to play an important role in the blood modifications observed after total radiotherapy. Preliminary splenectomy, protection of the spleen during irradiation, and irradiation of the exteriorized spleen modified the picture but little.

The historical development and use of x-ray, radioactive agents, and other modes of therapy are discussed. Most of the agents are considered as adjuvants to radiation therapy, except in acute leukemias, where irradiation is harmful and multiple transfusions may be helpful. As a rule, local irradiation is used at the beginning of treatment, and adjuvants are used between courses of therapy. When relative resistance to local irradiation has developed, either continuous use of one or more of the adjuvants or total roentgen therapy is utilized. In favor of total roentgen therapy are the following: (1) better hematologic improvement; (2) slower, but just as certain, regression of the spleen; (3) apparently longer periods of remission; (4) absence of sclerosis of the spleen and radioresistance. On the other hand, total roentgen therapy requires close surveillance, and the white count may decrease for ten days following cessation of therapy. Treatment is usually stopped in chronic myeloid leukemia when the white count reaches 10,000. A total dose of about 150 to 300 r is used. Also worthy of note is that P^{32} appears to give remissions similar to total body therapy, and while irradiation sickness is not so pronounced, regression of spleen and nodes is greater.

Since the white count may vary greatly from time to time, and since it may increase to 30–40,000 and remain somewhat stable, it is well to take into consideration the general condition of the patient, degree of anemia, fever, size of spleen, etc., before re-treatment is started.

Subleukemia and aleukemia respond well to small doses. Lymphoid leukemia is treated with local irradiation, for the white count may be quite unstable.

In cases treated over the spleen (myeloid leukemia), the average survival was three years and two months. Patients receiving total body therapy with maintenance therapy survived for an average of two years and five months, and those treated by intermittent total irradiation had an average survival of three years and four months. In 32 cases of lymphoid leukemia, the mean survival was three years and four months.

Nine illustrations; 1 table.

CHAS. NICE, M.D.
University of Minnesota

Place of Radiotherapy in the Treatment of Chronic Lymphoid Leukaemia. Ronald Bodley Scott. J. Faculty of Radiologist **1:** 61–66, July 1949.

The author describes his observations in the treatment of lymphoid leukemia. He feels that x-radiation will not cure, it will not prolong life or greatly alter the course of the disease, and it will not lead to repair of anemia. It should be used only to treat those patients it can help, so as not to discredit the method for failure to achieve the impossible. It can be used to diminish the size of lymph node tumors and of the enlarged spleen and it will reduce the lymphocyte count in the peripheral blood. Its main value seems to lie in the first of these effects. Reduction of the lymphocytosis apparently is of no benefit to the patient, since it may vary as much as 200,000 per c. mm. in a month in patients receiving no x-ray therapy.

Five illustrations; 2 tables.

D. R. BRYANT, M.D.
The Henry Ford Hospital

Radiotherapeutic Treatment of Leukæmia. J. S. Fulton. J. Faculty of the Radiologists **1:** 67–69, July 1949.

Three fundamental questions are proposed in approaching the problem of radiotherapy in leukemia: Why do we treat? When do we treat? How do we treat?

First, treatment is palliative and must not accelerate the course of the disease. It should be directed toward relieving such distressing symptoms as are related to splenic enlargement, lymph node enlargement, and anemia. It should enable the patient to lead a more active and normal life and extend the expectation of life.

Second, acute leukemia, whether primary or as a terminal feature of chronic leukemia, is not treated. Chronic leukemia is treated only when the above conditions exist, and the blood picture may be used as an index to the course of treatment.

Third, five methods of irradiation are presented: (1) confined to the spleen; (2) to local areas of bone marrow (3) to the circulating blood; (4) whole-body irradiation; (5) radioactive substances. The author briefly discusses the value of these methods.

D. R. BRYANT, M.D.
The Henry Ford Hospital

Short-Distance Low-Voltage Roentgen Therapy of Inflammatory Conditions in the Tonsils. Sven Hultberg. Acta radiol. **32:** 66–70, July 31, 1949.

In discussing radiation therapy of inflammatory conditions of the tonsils the author makes a definite distinction between (*a*) treatment of acute tonsillitis and (*b*) irradiation of chronic inflammatory conditions with hypertrophy of the tonsils. For cases of high-febrile acute tonsillitis he uses small doses of 15 to 25 r on the skin, at 180 kv., with 0.5 mm. Cu, and 1.0 mm. Al filtration, at a focal skin distance of 40 to 50 cm. The patient experiences considerable relief after only a few hours.

In cases of chronic tonsillitis external roentgen therapy is used, as well as local radium application, both giving satisfactory results. Ten cases of chronic tonsillitis treated with short-distance low-voltage roentgen therapy between the years of 1943 and 1948 are reported. Dosages of 500 r were used, repeated two or three times at intervals of two to three days, using 50 kv., 2 ma., 4 cm. focal skin distance, and no additional filtration. The author believes that this form of therapy should be used more often as against surgery. All of his patients showed a remarkable improvement.

J. B. SCRUGGS, M.D.
University of Arkansas

Value of X-Ray Therapy in Orthopedic Cases. Charles M. White and Charles Rombold. J. Kansas M. Soc. **50:** 325–329, July 1949.

The authors present the results of x-ray treatment in a group of 100 consecutive rheumatic cases. Significant improvement was obtained in 92 per cent of cases diagnosed as synovitis, in 88 per cent of cases of shoulder bursitis, and in 75 per cent of cases of Marie-Strümpell arthritis. In hypertrophic spondylitis and fibrositis and in osteoarthritis good results were obtained in 38 and 53 per cent respectively.

The technical factors were: 200 kv.p., 1.0 mm. Cu and 1.0 mm. Al filter, focal skin distance 50 cm. In chronic cases 200 r are given once a week, to a total of 800 r. In Marie-Strümpell arthritis, the entire back is treated through wide portals, with 200 r to each portal until 600 r is given. In acute shoulder bursitis 100 r is given, followed by 200 r on alternate days for two to three treatments. Chronic cases receive 200 r once a week.

The author believes that x-ray therapy in the rheumatic diseases discussed shows very encouraging results. It should be used as a local treatment in conjunction with orthopedic and medical methods.

One illustration; 1 table.

DONALD S. CHILDS, JR., M.D.
The Mayo Foundation

Subacromial Bursitis. A Classification and an Evaluation of the Results of Roentgen Therapy. A. C. McCurrach, G. I. Norton, and J. Bouchard. Canad. M. A. J. **61:** 39–44, July 1949.

A series of 109 cases of subacromial bursitis, treated from 1940 to 1946, is discussed by the authors. They classify this disorder into five main groups, depending on the duration of symptoms and on the clinical findings, as follows: (1) acute bursitis (symptoms of one month or less); (2) subacute bursitis (history of one to three months); (3) chronic bursitis (over three months duration); (4) chronic bursitis with acute exacerbation; (5) periarthritis (a lengthy history of pain and limitation of movement, and a fixed shoulder with winging of the scapula on abduction).

Degeneration resulting from minor repeated trauma may occur in the tendon of the "rotator cuff" of muscles at or near their insertion into the periosteum of the humerus. Symptoms arise only when the floor of the subacromial bursa is irritated by the degenerated or calcified tendon. In this series of patients 80 per cent could be considered to belong to the non-laboring class.

Calcification in the supraspinatus tendon was best seen in internal rotation.

Three different methods of roentgen therapy were employed. Medium voltage was used in one and high-voltage radiation in the others. An increase in the severity of symptoms is to be anticipated a few hours following the first application of x-radiation in all cases, particularly the acute. Acute and subacute bursitis respond favorably, particularly if calcification is present. Chronic bursitis with an acute exacerbation of symptoms was found to respond almost as well as the acute form. The response is considerably less in the chronic form, and roentgen therapy in periarthritis is not recommended.

It is suggested that, as soon as relief from acute pain is accomplished, active supervised exercises of the shoulder be instituted, particularly in the chronic cases.

Nine roentgenograms; 3 tables.

ROBERT H. LEAMING, M.D.
Jefferson Medical College

Treatment of Bursitis and Peritendonitis Calcarea of the Shoulder Joint by Roentgen Therapy. Martin S. Abel and Irving I. Lomhoff. Permanente Foundation M. Bull. **7:** 90–93, July 1949.

X-rays have been used successfully in the treatment of the painful shoulder for many years. They may exert simply a non-specific analgesic effect or may possibly have a positive action in reducing the inflammatory changes about the shoulder.

One hundred and thirty-four patients with bursitis

and peritendinitis were studied. The treatment factors were: 200 kv. p., 0.5 mm. copper and 1.0 mm. aluminum filtration, 25 ma., 50 cm. distance, h.v.l. 1.17 mm. copper. The dose per treatment was 150 to 200 r (in air), and treatments were given on alternate days to a total of approximately 1,000 r (in air).

The patients are grouped according to duration of symptoms: (1) acute cases (less than two months); (2) subacute cases (two to six months); (3) chronic cases (six months or longer).

Of the 134 patients, 23 per cent showed no improvement or slight improvement and were considered as failures. These failures comprised 12 per cent of the acute group, 16 per cent of the subacute group, and 45 per cent of the chronic group. Of the 7 patients in the acute group considered as failures, 3 showed roentgenographic evidence of associated arthritis, and this complication may have accounted for the poor result in these patients.

Of the entire group, 21 per cent showed moderate improvement and 56 per cent showed marked improvement or complete relief of symptoms. These results were obtained in 88 per cent of the acute group, 84 per cent of the subacute group, and 55 per cent of the chronic group. Both subjective relief of pain and objective improvement in range of motion were included in estimation of improvement.

The authors regard the prognosis to be excellent for alleviation of symptoms at any stage of the disease, and the shorter the duration of symptoms, the better the therapeutic effect. It was observed that in many instances a subdeltoid bursitis or peritendinitis with calcification could be present and asymptomatic for some time, until trauma to the shoulder occurred. Symptoms of an acute nature would then develop and respond to treatment.

Three roentgenograms; 1 table.

DANIEL WILNER, M.D.,
Atlantic City, N. J.

RADIOISOTOPES

Deposition and Fate of Plutonium, Uranium, and Their Fission Products Inhaled as Aerosols by Rats and Man. Kenneth G. Scott, Dorothy Axelrod, Josephine Crowley, and Joseph G. Hamilton. Arch. Path. **48:** 31–54, July 1949.

Experiments were carried out to ascertain the possible hazard resulting from inhalation of fissionable materials and fission products. Aerosols of plutonium, uranium plus fission products, and protoactinium were administered to rats, and the aerosol Zr^{89} both to rats and to a human subject. These aerosols were almost totally retained by the heads and the lungs immediately after exposure. After four days the lungs contained the largest percentage of the elements. The deposits in the head and bronchial tree were quickly eliminated via the gastro-intestinal tract. The same path of elimination was presumably used by the non-ciliated portion of the lungs, but at a slower rate. The small percentage absorbed into the body was primarily deposited in the skeleton after conditions of equilibrium had been established.

Radioautographic studies indicated that the pulmonary site of deposition of these materials is in the bronchial passages and the alveolar structures. The materials are rapidly removed from the bronchial tree, presumably by ciliary action, and are slowly released from the alveoli. No accumulation of any of the radioelements was observed in either blood vessels or lymph nodes.

Eleven illustrations; 8 tables.

On the Multiple Possibilities of a Long-Life Artificially Radioactive Isotope (Co^{60}), in Fluid Form, for the Radiation Therapy of Malignant Tumors. J. H. Müller. Schweiz. med. Wchnschr. **79:** 547–551, June 18, 1949. (In German)

The author describes a new technic of intracavitary therapy, especially applicable to the bladder but suitable for other cavities. An aqueous solution of a radioactive salt is instilled into a rubber balloon previously inserted into the cavity. The use of a solution of radioactive cobalt (Co^{60}) as the chloride is suggested because of its relatively long half-life (5.3 years), and because its beta ray emission is very soft (0.3 mev.) and is completely absorbed by the rubber balloon, leaving practically pure gamma radiation (1.2 mev.) for the therapy. The author considers the method very promising but does not report his case results, except to state in a footnote that a rectosigmoid lesion was treated with "encouraging" results and that a case of uterine carcinoma was found "suitable for this form of treatment."

Three roentgenograms; 3 radioautographs; 1 table.

LEWIS G. JACOBS, M.D.
Oakland, Calif.

EFFECT OF RADIATION

Protection of Personnel Engaged in Roentgenology and Radiology. F. T. Hunter, O. E. Merrill, J. G. Trump, and L. L. Robbins. New England J. Med. **241:** 79–89, July 21, 1949.

This is a study of the quantity and quality of radiation to which radiologists are exposed during routine examinations. The study was made on presdwood phantoms with the knowledge of the deficiency of this material. Various studies were carried out by means of an ionization chamber and film badge examinations. The means and methods of making the measurements are described in detail and numerous graphs are presented.

Several points in this study are particularly pertinent:

1. It appears that the optimal factors for fluoroscopic examination are a kv.p. of about 85, milliamperage of about 5, and filtration of about 3 mm. aluminum.
2. The field size during fluoroscopy and spot-film work should be kept as small as possible, since scattered irradiation increases with the size of the field (the square of the field dimension).
3. The fluoroscopic room should be large in order to minimize back-scatter from the ceiling and walls.
4. Contrary to the current opinion, the 90-degree scatter from the patient at fluoroscopy is actually more penetrating than the direct beam, since all the softer irradiation has been filtered out and the right-angle scatter is produced chiefly by the Compton-scattering process.

A further development of monitoring of x-ray personnel by means of the film badge is described. At the Massachusetts General Hospital all personnel are required to wear the badge during working hours. It has been found that x-ray personnel are exposed to irradiation of less than 0.1 r over a two-week period, while those handling radium show greater exposure but still less than 0.3 r in a two-week period.

Ten illustrations. JOHN B. MCANENY, M.D.
Johnstown, Penna.

Three Cases of Irradiation Injuries. Sven Hultberg Acta radiol. **32:** 17–27, July 31, 1949.

Three cases of irradiation injuries are reported.

The first of the cases was that of a young unmarried woman who received x-ray exposure by standing with her lower abdomen against a roentgen tube in an attempt to cause abortion. The exposure was for five minutes and was repeated at the end of one month. One month after the second exposure the patient noticed a beginning redness just below the umbilicus, and two months later she had an ulcerating wound of the lower abdomen that showed no tendency to heal. She was treated by electroexcision of the wound with coagulation of its base. Eighteen months after the original exposure the abdominal wound had healed.

The second patient was a physician who in the course of two months performed fluoroscopic examinations on seven occasions without the use of protective equipment. Within two months after exposure a marked radiation necrosis of the three middle fingers of the right hand developed. The necrosis healed with conservative treatment two months later. The author estimates that this patient received radiation equivalent to a single dose of 800 to 1,000 r.

The third patient was a male laboratory worker assisting in roentgen screening of castings for the detection of possible air pockets in a metal works. On several occasions he stepped in front of the protective wall provided in connection with the fluorescent screen to indicate the points on the metal where air pockets may have occurred, thus exposing his hands, without the protection of gloves, to radiation. At the end of two months he began to have swelling and discoloring of the right index finger. Ultimately the index fingers of both hands were amputated.

The author urges systematic instruction and the enforcement of rigorous rules for protection from radiation in every roentgen or radium establishment in an effort to overcome the negligence and lack of judgment so frequently encountered.

Nine illustrations. J. B. SCRUGGS, M.D.
University of Arkansas

Radiation Osteitis of the Ribs. Report of a Case with Fractures Appearing Four and One-Half Years and Eleven Years After Therapy. Ernst A. Pohle and Ralph C. Frank. J. Bone & Joint Surg. **31-A:** 654–657, July 1949.

A 49-year-old white female received radiation therapy following operative removal of a carcinoma of the breast, four courses being given over a period of two years for a total dose of 7,750 r in air to each of four fields. On follow-up examination four and one-half years after the first course, radiation osteitis with fracture was found in the anterolateral arc of the left 4th rib. Six and a half years after this, fracture and radiation osteitis were found in the left third rib anterolaterally. At this time, the first fracture was in the process of healing.

Radiation osteitis has been frequently reported in the literature but most commonly in weight-bearing bones. In rib involvement, the process is usually asymptomatic and painless, and spontaneous healing frequently occurs. The fear of production of radiation osteitis should never interfere with the administration of adequate radiation therapy for carcinoma of the breast. One is cautioned against misinterpreting radiation osteitis for a metastatic lesion in the rib.

Roentgenographically, the first change is usually a transverse irregular fracture line appearing in the anterior portion of the rib, with osteoporosis and often displacement of the fragments. At a later date, bone sclerosis may appear. After healing, the bone density is usually increased.

Radiation osteitis may occur from eleven months to sixteen years following irradiation.

Two roentgenograms. JOHN B. MCANENY, M.D.
Johnstown, Penna.

Problem of Plantar Radiodermatitis. Andrew H. Montgomery, Royal M. Montgomery, and Donald C. Montgomery. New York State J. Med. **49:** 1665–1667, July 15, 1949.

The authors discuss in detail the problem of diagnosis and treatment of radiodermatitis on the plantar surfaces of the feet. Most cases of plantar radiodermatitis result from the radiation treatment of corns, calluses, and warts. Small areas of radiodermatitis are painful and are covered with a hyperkeratotic mass. These may resemble plantar warts and the correct diagnosis is made only following careful paring and observation of the lesion. More advanced lesions are ulcerated and are extremely painful. Mosaic warts may be adjacent to a patch of radiodermatitis, being remnants of the original lesion for which radiation therapy was given.

Following diagnosis, one must make a choice between the longer conservative therapy and the shorter surgical one. The authors have never seen a small area of radiodermatitis develop into a cancer.

Four photographs. DONALD S. CHILDS, JR., M.D.
The Mayo Clinic

Blood Groups and Effects of Roentgen Irradiation in Retrolental Fibroplasia. Thomas O. Paul. Arch. Ophth. **41:** 659–666, June 1949.

The author reports 12 cases of retrolental fibroplasia, a condition usually occurring bilaterally in premature infants and unilaterally in full term infants. It is characterized by a gray pupillary reflex, retrolental vascular membrane, microphthalmos, a shallow anterior chamber with anterior synechia, predisposing the eye to the development of secondary glaucoma, remains of an anterior pupillary membrane, a spheroidal lens, and searching nystagmus. A study of the possibility that a blood factor may be the cause of prematurity in children with this congenital malformation was inconclusive.

Several infants were given roentgen radiation, the total dose ranging from 400 to 1,000 r, in an attempt to devascularize the retrolental membrane. Of the 9 eyes thus treated, 3 showed slight improvement, with slight thinning at the less dense borders of the membrane, while 6 showed no apparent change. In no case was the thinning sufficient to be regarded as of any help preliminary to needling of the lenses. Little or no effect on the membrane vessels could be observed.

INDEX TO VOLUME 54

A

ABDOMEN. See under names of abdominal organs, as Liver; Stomach

ABEL, MARTIN S., and LOMHOFF, IRVING L.: Treatment of bursitis and peritendonitis calcarea of the shoulder joint by roentgen therapy (ab), June, 924

ABRAMS, M., SEDLEZKY, I., and STEARNS, DAVID B.: Osteitis pubis (ab), March, 467

ABRAMSON, DANIEL J., and KAMBERG, SAMUEL: Spondylitis, pathological ossification, and calcification associated with spinal-cord injury (ab), March, 465

ABSCESS. See Brain; Lungs; Spine

ABSHER, W. K., and CLINE, F., Jr.: A correlated study of tuberculin, histoplasmin and coccidioidin sensitivities with pulmonary calcifications in the Rocky Mountain area (ab), May, 771

ACCETTOLA, ALBERT B. See **HOTCHKISS, ROBERT S.**

ACIDOSIS
—hyperchloremic acidosis and nephrocalcinosis: syndrome of pure "lower nephron" insufficiency (ab), Ezra M. Greenspan, Feb., 305

ACNE VULGARIS
—radiotherapy: comparative tests of treatment technics, Henry Quastler, Feb., 247

ACTINOMYCOSIS
—pulmonary actinomycosis (ab), S. F. Oosthuizen and M. H. Fainsinger, Feb., 296

ADAMS, G. D. See **QUASTLER, H.**

ADAMS, RALPH: Diagnosis and treatment of lung tumor, March, 451

ADAMS, W. E. See **FRITZ, JAMES M.**

ADENOMA. See Bronchi tumors; Parathyroid

ADENOMYOSIS. See Endometriosis

ADOLESCENCE
—diagnosis of chronic subdural hematoma in children and adolescents (ab), J. W. D. Bull, Jan., 130

ADOLPH, WILLIAM, and TAPLIN, GEORGE V.: Use of micropulverized barium sulfate in x-ray diagnosis; preliminary report, June, 878

ADRENAL PREPARATIONS
—treatment of radiation sickness with adrenal cortical hormone (desoxycorticosterone acetate); preliminary report on 50 cases (ab), Friedrich Ellinger, et al., Feb., 312

ADRENALS
—calcified cyst of cortex without endocrine symptoms, M. X. Anderson, Howard G. Roberts, and Ernest T. Smith, Feb., 236
—carcinoma of prostate: statistical study and evaluation of endocrine therapy, with a preliminary report of an additional method of treatment (irradiation of adrenals) (ab), Harry Q. Gahagan and J. L. Fischman, Feb., 308

tumors
—pheochromocytoma, with successful removal; case (ab), A. L. Forsgren, et al, Jan., 149

ADVISORY EDITORIAL BOARD (Radiology) (ed), May, 754

AGRESS, CLARENCE M. See **PRINZMETAL, MYRON**

ALBERS, EDWARD C., and BULEY, H. M.: X-ray therapy of inflammatory lesions of the eyelids (ab), May, 797

ALBRIGHT'S SYNDROME. See Bones

ALDEN, HERBERT S., JONES, JACK W., and RANKIN, JOSEPH: Roentgen ray treatment of the eye. Further experiences (ab), March, 472

ALEMÁN, EMILIO: Syndrome of sinus and bronchial disease in children. Its treatment by detergent antibiotics (ab), April, 614

ALEXANDER, EBEN, Jr., and JANES, ROBERT M.: Neurofibroma: Benign intraspinal-intrathoracic "hour-glass" tumor with paraplegia (ab), Jan., 144

ALEXANDER, GILBERT H., and ALEXANDER, RALPH E.: Use of gastric mucin as a barium suspension medium. Preliminary report, June, 875

ALEXANDER, RALPH E. See **ALEXANDER, GILBERT H.**

ALLEN, J. GARROTT. See **JACOBSON, LEON O.**

ALLEN, M. LOWRY. See **HICKEN, N. FREDERICK**

ALLERGY. See Food

ALLGOOD, J. L., Jr. See **TORPIN, RICHARD**

ALLING, EMERY E. See **BYRON, FRANCIS X.**

ALLISON, P. R.: Obstruction of the gastro-oesophageal junction (ab), June, 907

ALMOND, A. H. G. See **PARKE, W.**

ALMY, G. M. See **QUASTLER, H.**

ALPERS, BERNARD J., and RYAN, JAMES J.: Verified cerebral aneurysm with negative arteriogram (ab), Feb., 294

ALY, SAMIRA M., and WILSON, C. W.: Observations on the ionization produced by high-voltage radiation in moulded ionization chambers with walls of various effective atomic numbers (ab), April, 635

AMEBIASIS
—thoracic complications (ab), Robert R. Shaw, May, 774

AMENORRHEA
—treatment of secondary amenorrhea with low dosage irradiation of ovaries and pituitary gland (ab), P. Lyon Playfair and Alan Booth, March, 474

AMINOPTERIN
—treatment of leukemia and allied disorders with folic acid antagonists: effect of aminopterin on skeletal lesions, Frederic N. Silverman, May, 665

AMINO-THIAZOL. See Thyroid, cancer

AMYOTONIA CONGENITA
—associated with occlusion of the sagittal sinus and bilateral subdural hygroma: demonstration of occlusion by diotrast sinography; case (ab) Michael Scott, Jan., 130

ANDERSON, D. M. See **FORSGREN, A. L.**

ANDERSON, GEORGE W., and BUSBY, TRENT: Sickle cell anemia and pregnancy (ab), June, 916

ANDERSON, M. X., ROBERTS, HOWARD G., and SMITH, ERNEST, T.: Calcified cyst of the adrenal cortex without endocrine symptoms, Feb., 236

ANEMIA
erythroblastic
—Cooley's anemia in Negro girl (ab), John D. Coffey, Jr., and David D. Salmon, May, 787
sickle-cell
—sickle-cell anemia and pregnancy (ab), George W. Anderson and Trent Busby, June, 916
—simulating advanced rheumatoid arthritis; case (ab), Eugene L. Coodley and Morley J. Kert, May, 787
splenic
—Gaucher's disease in a Negro; case (ab), Roger M. Choisser and Robert R. Montgomery, May, 787

ANESTHESIA. See Bronchi, roentgenography

ANEURYSM
aortic
—retrograde arteriography in the diagnosis of cardiovascular lesions: visualization of aneurysms and peripheral arteries (ab), Norman E. Freeman and Earl R. Miller, Jan., 137
—roentgen diagnosis of ruptured aneurysm of abdominal aorta, Charles E. Grayson and Bayles R. Kennedy, March, 413
arteriovenous. See Aneurysm, cerebral; Aneurysm, pulmonary
cardiac
—(ab), Max Caplan and Paul M. Sherwood, March, 453
—aneurysm of left ventricle secondary to myocardial infarction; case in 35-year-old man (ab), H. L. Newbold, et al, March, 454
—myocardial infarction and cardiac aneurysm: their roentgen diagnosis (ab), Eric Samuel, March, 454
—tuberculoma—simulating cardiac aneurysm or localized pericardial effusion (ab), Kjell Liverud, June, 899
carotid
—unilateral paralysis of eye muscles associated with intracranial saccular aneurysms (ab), Edwin Boldrey and Earl R. Miller, Jan., 137
cerebral
—angiographic studies of cerebral vessels in arteriovenous aneurysms (ab), R. Bunner, Feb., 294
—arteriovenous aneurysm of the great vein of Galen (ab), H. R. I. Wolfe and N. E. France, June, 896
—verified aneurysm with negative arteriogram (ab), Bernard J. Alpers and James J. Ryan, Feb., 294
pulmonary
—arteriovenous aneurysm (ab), Charles Baker and J. R. Trounce, March, 453
—thromboendarteritis with multiple mycotic aneurysms of branches of pulmonary artery (ab), Conrad L. Pirani, et al, March, 453

ANGIOCARDIOGRAPHY. See Aorta; Arteries, pulmonary; Cardiovascular System; Lungs, tumors

ANGIOGRAPHY. See Aneurysm, cerebral; Brain

ANGIOMA. See Tumors, angioma

ANGIOSARCOMA. See Sarcoma, angiosarcoma

ANIDO, H. See **DIAZ, A. RODRIGUEZ**

ANKLE
See also Talus
—"a broken ankle" (ab), George Perkins, March, 467

ANTHRACOSIS. See Pneumoconiosis

ANTISPASMODICS. See Stomach, roentgenography

ANUS
cancer
—carcinoma of anal canal; treatment with very high voltage x-ray therapy (ab), I. G. Williams, March, 471

AORTA
See also Aneurysm
—complete transposition of aorta and a levoposition of pulmonary artery: clinical, physiological, and pathological findings (ab), Helen B. Taussig and Richard J. Bing, March, 455
—constricting vascular rings; 2 cases with recurrent respiratory infections (ab), Merl J. Carson and James Goodfriend, Jan., 136
—radiological studies of the abdominal aorta in individuals over 50 as an aid to the differential diagnosis between benign and malignant ulceration of the stomach (ab), A. Elkeles, April, 621
—right aortic arch with vascular ring constricting esophagus and trachea; 2 cases (ab), Béla Halpert, et al, April, 619

AORTA—*cont.*
—thoracic aortography by means of a cannula inserted percutaneously into the common carotid artery (ab), Gunnar Jönsson, May, 779
—transposition of aorta and pulmonary artery demonstrated by angiocardiography (ab), J. F. Goodwin, et al, June, 906
coarctation
—angiocardiography: its application to the diagnosis of coarctation, Bernard S. Epstein, Feb., 211
—diagnosis (ab), William L. Proudfit and A. Carlton Ernstene, March, 454
AORTIC VALVE
—calcified valve: clinical and radiologic features (ab), C. E. Davies and R. E. Steiner, March, 454
APPENDIX
—appendiceal calculi: incidence and clinical significance (ab), Benjamin Felson, April, 623
—value of appendiceal pain in the roentgen diagnosis of chronic appendicitis (ab), P. C. Smyrniotis, June, 909
ARACHNODACTYLIA
—arachnodactyly (Marfan's syndrome); 2 case reports with etiologic implications (ab), Robert C. Moehlig, May, 783
ARBUCKLE, ROBERT K.: Solitary tumors of the chest. The differential diagnosis in fifty proved cases (ab), June, 898
ARGENTAFFINOMA. See Stomach, cancer
ARIEL, IRVING M., HEAD, JEROME R., LANGSTON, HIRAM T., and AVERY, EDWARD E.: Use of interstitial radon seeds and needles in inoperable lung cancer (ab), June, 921
——See **GIBBEL, MELVIN I.**
——See **SIMMONS, MARVIN W.**
ARKIN, ALVIN M.: Mechanism of the structural changes in scoliosis: preliminary report (ab), Feb., 302
ARNESON, A. N.: Symposium on cancer of the cervix uteri. Introduction, June, 803
ARNOLD-CHIARI DEFORMITY. See Brain
ARTERIES
See also Aneurysm; Aorta; Brain; Cardiovascular System; etc.
carotid
—arteriographic demonstration of collaterals between internal and external carotid arteries (ab), F. Marx, Jan., 138
—thoracic aortography by means of a cannula inserted percutaneously into the common carotid artery (ab), Gunnar Jönsson, May, 779
coronary
—differential diagnosis of hiatus hernia and coronary artery disease (ab), Arthur M. Master, et al, March, 456
—simultaneous association of situs inversus, coronary heart disease and hiatus hernia; report of case and review of literature (ab), Henry N. Rosenberg and I. N. Rosenberg, April, 456
pulmonary. See also Heart, abnormalities
—angiocardiographic study (ab), Charles T. Dotter and Israel Steinberg, May, 778
—complete transposition of aorta and a levoposition of pulmonary artery: clinical, physiological, and pathological findings (ab), Helen B. Taussig and Richard J. Bing, March, 455
—transposition of aorta and pulmonary artery demonstrated by angiocardiography (ab), J. F. Goodwin, et al, June, 906
subclavian
—anomalous right subclavian artery, Benjamin Felson, Sander Cohen, Sanford R. Courter, and Johnson McGuire, March, 340
vertebral
—vertebral angiography (ab.), Oscar Sugar, et al, Jan., 137
ARTERIOGRAPHY. See Arteries; Brain, blood supply; Extremities, blood supply
ARTHRITIS
See also Hip; Spine
—method for the quantitative roentgenological determination of the amount of calcium salts in bone tissue: its use in the study of calcium reduction in the phalanges of the fingers in chronic polyarthritis (ab), Arne Engström and Sölve Welin, May, 783
—sickle-cell disease simulating advanced rheumatoid arthritis; case (ab), Eugene L. Coodley and Morley J. Kert, May, 787
ARTHROGRAPHY. See Knee
ASCARIS
—intestinal obstruction due to ascaris (ab), Samuel Skapinker, June, 908
ASCITES
—benign pleural effusion and ascites associated with adenocarcinoma of the body of the pancreas (ab), Emil Rothstein, April, 617
ASHER, LEONARD M., and COHEN, SIDNEY: Gastroscopic perforation of the esophagus and stomach. Report of three cases (ab), May, 780
ASTRAGALUS. See Talus
ATELECTASIS. See Lungs, collapse
ATLAS AND AXIS
—platybasia associated with an unusual case of pulmonary tuberculosis; case with necropsy (ab), Isaac Epstein, April, 613
ATOMIC ENERGY
See also Radioactivity
—clinical manifestations of acute radiation illness in goats; comments on therapy (ab), Eugene P. Cronkite, Feb., 312
—critical analysis of the syndrome of acute total body radiation illness, its role in atomic warfare and its influence on the future practice of military medicine (ab), Eugene P. Cronkite and William H. Chapman, Jan., 155
—fogging of photographic film by radioactive contaminants in cardboard packaging materials (ab), J. H. Webb, March, 476
—human tolerance for large amounts of radiation, R. R. Newell, April, 598
—physicians in an atomic war (ab), Leon O. Jacobson, et al, May, 802
ATWELL, S. See **DONHAUSER, J. L.**
AUB, JOSEPH C., and GRIER, ROBERT S.: Acute pneumonitis in workers exposed to beryllium oxide and beryllium metal (ab), April, 616
AUBRY, TILLIER, PORTIER, and BÉRANGER: Radiological aspects of vertebral syphilis (report of three cases) (ab), March, 466
AUSTIN, V. T. See **QUASTLER, H.**
AVERY, EDWARD E. See **ARIEL, IRVING M.**
AXELROD, DOROTHY. See **SCOTT, KENNETH G.**
AXILLA. See Hidradenitis
AYRES DE SOUSA: Roentgen kymography in the study of vesico-ureteral reflux (ab), May, 790
——**DE CARVALHO, LOPO, and VIDAL, CARLOS:** Roentgenkymographic study of the pulmonary circulation (ab), Feb., 297
AZZOPARDI, P. G. See **FRIDJOHN, L.**

B

BACKACHE
—new method of demonstration of ligamentous changes in lumbago and sciatica (ab), F. K. Fischer, March, 463
BACLESSE, FRANCOIS: Roentgentherapy in cancer of the hypopharynx (ab), June, 919
BACLESSE, M.: Roentgen therapy alone in the treatment of operable and non-operable cancers of the breast (ab), May, 793
BACTEREMIA
—double gallbladders; report of 4 cases, one with suppurative cholangitis and bacteremia (ab), N. Frederick Hicken, et al, Feb., 300
BAGLEY, CHARLES, Jr., THOMPSON, RAYMOND K., and CROSBY, R. M. N.: Distention of the subarachnoid space with cerebrospinal fluid in infants; enlargement of the head and spasticity; surgical correction (ab), April, 613
BAHNSON, HENRY T. See **COOLEY, ROBERT N.**
BAKER, CHARLES, BROCK, R. C., CAMPBELL, MAURICE, and SUZMAN, S.: Morbus caeruleus: a study of 50 cases after the Blalock-Taussig operation (ab), March, 455
——**and TROUNCE, J. R.:** Arteriovenous aneurysm of the lung (ab), March, 453
BAKER, EVERETT M.: Carcinoma of the cervix—review of 100 cases (ab), Jan., 151
BALABAN, MIRIAM. See **RING, GORDON C.**
BARCLAY, A. E., and BENTLEY, F. H.: Vascularisation of the human stomach. A preliminary note on the shunting effect of trauma (ab), Jan., 139
BARGEN, J. ARNOLD. See **McCREADY, FRED J.**
BARIUM
—double-contrast study of the colon: a comparative study of barium sulfate preparations, Robert D. Moreton and Charles W. Yates, April, 541
—use of gastric mucin as a barium suspension medium; preliminary report, Gilbert H. Alexander and Ralph E. Alexander, June, 875
—use of micropulverized barium sulfate in x-ray diagnosis; preliminary report, William Adolph and George V. Taplin, June, 878
BARNES, S. W. See **INGRAM, M.**
BARNETT, JAMES C. See **ELLINGER, FRIEDRICH**
BARON, G. J. See **KARR, JOHN W.**
BARTH, EARL E., and IRWIN, GEORGE E., Jr.: Traumatic pneumocephalus, March, 424
——See **MART, JOHN A.**
BARTHOLIN'S GLANDS
cancer
—radium therapy for carcinoma (ab), Harry H. Bowing, et al, March, 472
BASOPHILISM. See Pituitary Body
BASS, H. E.: Delayed pneumonia and urticaria following bronchography (ab), March, 448
BASSETT, ROBERT C., PEET, MAX M., and HOLT, JOHN F.: Pial-medullary angiomas. Clinicopathologic features and treatment (ab), May, 788
BASSINI OPERATION. See Hernia
BAYLIN, GEORGE J., REEVES, ROBERT J., and KERMAN, HERBERT D.: A roentgen and clinical study of nasopharyngeal malignancies (lympho-epithelioma and transitional cell carcinoma) (ab), May, 769
BECK, M. DOROTHY. See **HUEBNER, ROBERT J.**
BEDDARD, F. D.: Arteriovenous fistula of the lung (ab), May 774
BEIX, J. See **NADAL, R.**
BELLO, CARMEN T. See **KERN, RICHARD A.**
BELONOSCHKIN, B. See **HEYMAN, J.**
BENASSI, ENRICO: Examination of the stomach in the supine position (ab), March, 458

BENSON, ELLIS S. See **FIRESTONE, GEORGE M.**
BENTLEY, F. H. See **BARCLAY, A. E.**
BÉRANGER. See **AUBRY**
BERG, ROGER M., BOYDEN, EDWARD A., and SMITH, FRANKLIN R.: An analysis of variations of the segmental bronchi of the left lower lobe of fifty dissected and ten injected lungs (ab), March, 446
BERGLUND, GEORGE. See **RAAF, JOHN**
BERGMAN, H. C. See **PRINZMETAL, MYRON**
BERKMAN, A. TEVFIK: Postoperative radiotherapy of breast cancers, April, 572
BERNSTEIN, CHARLES. See **FLEISCHNER, FELIX G.**
BERYLLIUM
—acute dermatitis and pneumonitis in beryllium workers; review of 406 cases in 8-year period with follow-up on recoveries (ab), Joseph M. DeNardi, et al, May, 772
—acute pneumonitis in a beryllium worker (ab), G. Riddell Royston, May, 772
—acute pneumonitis in workers exposed to beryllium oxide and beryllium metal (ab), Joseph C. Aub and Robert S. Grier, April, 616
—causes of dyspnea in chronic pulmonary granulomatosis in beryllium workers (ab), Robert A. Bruce, et al, March, 450
BETA RAYS. See Radon; Radioactivity
BETATRON
—letter to editor, Roger A. Harvey, Feb., 283
—technic for application of the betatron to medical therapy, with report of one case (ab), H. Quastler, et al, April, 635
BÉTOULIÈRES, P. See **MARQUÈS, P.**
BICKEL, WILLIAM H. See **NORLEY, THEODORE**
BICKFORD, B. J.: Mediastinal cysts of gastric origin. Report of a case (ab), March, 452
BILE
—stratification of bile in gallbladder and cholelithiasis (ab), B. A. Campbell and A. C. Burton, May, 783
BILIARY TRACT
See also Gallbladder
—acute pancreatitis following cholangiography (ab), R. L. Zech, June, 910
—anatomic variations of the extrahepatic biliary system as seen by cholangiographic studies (ab), N. Frederick Hicken, et al, April, 623
—clonorchiasis with marked eosinophilia and pulmonary infiltrations; unusual case (ab), George E. Cartwright, Jan., 134
—double gallbladders; 4 cases, one with suppurative cholangitis and bacteremia (ab), N. Frederick Hicken, et al, Feb., 300
—modified technic for cholangiography and use of a new contrast medium (rayopake) for visualization of the biliary tree, Stanley H. Macht, March, 421
—observations on biliary-pancreatic dynamics in a normal human (ab), John D. Ryan, et al, June, 909
BING, RICHARD J. See **TAUSSIG, HELEN B.**
BIONDETTI, PAOLO: Clinical significance of the hypertonic kidney pelvis in non-specific pyelitis (ab), Feb., 306
BIRKHÄUSER, H.: On the organization of a photoroentgen survey (with a technical supplement) (ab), April, 616
BIRNBERG, CHARLES H. See **WEXLER, DAVID J.**
BISHOP, ROBERT E. See **KNEIDEL, JOHN H.**
BISHOP, WILLIAM A. See **MARBLE, HENRY C.**
af BJÖRKESTEN, G. See **SJÖQVIST, OLOF**
BLADDER
—cystitis emphysematosa; case report with review of literature (ab), Gerald H. Teasley, June, 918
—late renal changes in paraplegia: hydronephrosis due to vesico-ureteral reflux (ab), Herbert S. Talbot and R. Carl Bunts, April, 629
—normal and abnormal micturition: a study of bladder behavior by means of the fluoroscope (ab), S. Richard Muellner and Felix G. Fleischner, Jan., 148
—roentgen kymography in study of vesico-ureteral reflux (ab), Ayres de Souza, May, 790
cancer
—extravesical radium therapy (ab), R. Ogier Ward, Jan., 152
—implanter for radon seeds for use with McCarthy Foroblique Pan-Endoscope (ab), J. Robt. Rinker, June, 922
—symposium: carcinoma. Further aspects of treatment (ab), E. W. Riches, June, 922
—symposium: carcinoma. Treatment by radium (ab), Arthur Jacobs, June, 922
—symposium: carcinoma. Treatment by radon seed implantation and deep x-ray therapy (ab), J. L. E. Millen, June, 922
diverticula
—regression of diverticula following relief of vesical neck obstruction (ab), Clarence Schneiderman, March, 469
BLAHA, VERNON B., and SALTZSTEIN, HARRY C.: Diagnostic difficulties in rectosigmoid lesions (ab), May, 782
BLAKE, PAUL S. See **FRENCH, LYLE A.**
BLALOCK-TAUSSIG OPERATION. See Heart, abnormalities
BLAST. See Explosions
BLASTOMYCOSIS
—acute primary pulmonary blastomycosis, Chester P. Bonoff Feb., 157
BLOOD
See also Anemia; Leukemia; etc.
—blood changes in luminizers using radioactive material (ab), Ethel Browning, Feb., 312
—blood groups and effects of roentgen irradiation in retrolental fibroplasia (ab), Thomas O. Paul, June, 926
—observations on the blood of cyclotron workers (ab), M. Ingram and S. W. Barnes, Jan., 156
—relation of the cardiac volume to the weight and surface area of the body, the blood volume and the physical capacity for work (ab), Sven R. Kjellberg, et al, Jan., 137
—response of peripheral blood of swine to whole body x-ray radiation in the lethal range (ab), Eugene P. Cronkite, et al, April, 637
circulation. See also Blood Vessels; Extremities; Lungs
—further studies of the circulation with radioactive erythrocytes (ab), G. Nylin and S. Hedlund, March, 475
BLOOD PRESSURE
—heart in hypertension (ab), Edwin P. Maynard, Jr., April, 618
—hypertension without significant cardiac enlargement; clinicopathologic study (ab), Harry Gross and Abraham Jezer, April, 619
—hypertensive and ischemic heart disease: comparative clinical and pathological study (ab), C. V. Harrison and Paul Wood, June, 906
BLOOD VESSELS
See also Aorta; Arteries; Extremities; etc.
—radioactive isotopes in the study of peripheral vascular disease. I. Derivation of a circulatory index (ab), Morris T. Friedell, et al, May, 799
—radioactive isotopes in the study of peripheral vascular disease. II. Method of evaluation of various forms of treatment (ab), Fenton Schaffner, et al, May, 799
—study of peripheral vascular disease with radioactive isotopes (ab), F. W. Cooper, et al, May, 799
BLOOM, MARGARET A., and BLOOM, WILLIAM: Late effects of radium and plutonium on bone (ab), April, 636
BLOOM, WILLIAM. See **BLOOM, MARGARET A.**
BODY SECTION ROENTGENOGRAPHY
—diagnosis of bronchial carcinoma by means of tomography (ab), Anni Stangl, June, 899
—tomographic demonstration of broncholiths (ab), Ernst Theilkäs, Feb., 297
—tomography as an aid in the diagnosis and treatment of pulmonary tuberculosis (ab), Alan King, Jan., 133
—tomography of larynx in disseminated pulmonary tuberculosis (ab), Max E. Galarza, June, 897
—useful procedure in tomographic exploration of bronchi (ab), René Jeanneret, et al, May, 770
—value of lateral view in tomography of the thorax (ab), P. Chatton, et al, March, 447
BOECK'S SARCOID. See Sarcoidosis
BOET, J. N. See **van DOORN, C. van W.**
BOHAN, KENNETH E. See **HALPERT, BÉLA**
BOLDRÉY, EDWIN, and MILLER, EARL R.: Unilateral paralysis of eye muscles associated with intracranial saccular aneurysms (ab), Jan., 137
BOLKER, NORMAN: Early diagnosis of carcinoma of the stomach (ab), April, 620
BOLTON, V. L. See **FAWCETT, N. W.**
BONES
See also under names of Bones
—congenital pseudarthrosis of the tibia and its relation to fragilitas ossium: report of case and review of literature (ab), F. Y. Khoo, May, 787
—dystrophy; rare case (ab), John Halliday, June, 911
—etiology, roentgenology, and therapy of transformation zones (ab), J. Heidenhoffer, April, 628
—infantile cortical hyperostoses; review of cases with a case report, William S. Thomas and Robert E. Murphy, May, 735
—late effects of radium and plutonium (ab), Margaret A. Bloom and William Bloom, April, 636
—masked steatorrhea revealed by pseudofractures (Looser's zones) with some observations on calcium excretion in convalescence (ab), J. R. Nassim and N. H. Martin, June, 912
—method for the quantitative roentgenological determination of the amount of calcium salts in bone tissue: its use in the study of calcium reduction in the phalanges of the fingers in chronic polyarthritis (ab), Arne Engström and Sölve Welin, May, 783
—obstetrical injuries to the long bones (ab), Spencer T. Snedecor and Harrison B. Wilson, March, 464
—osteoporosis of pelvic bones (acute bone atrophy of Sudeck) (ab), Harold W. Bruskewitz and George H. Ewell, May, 785
—polyostotic fibrous dysplasia—Albright's syndrome. Review of the literature and report of 4 male cases, 2 of which were associated with precocious puberty (ab), C. K. Warrick, April, 623
—polyostotic fibrous dysplasia (Jaffe-Lichtenstein) (ab), Max Hopf, April, 624
—roentgenographic estimation of the mineral content, George C. Henny, Feb., 202
—studies with colloids containing radioisotopes of yttrium, zirconium, columbium, and lanthanum. II. The controlled selective localization of radioisotopes of yttrium, zirconium, and columbium in the bone marrow, liver, and spleen (ab), Ernest L. Dobson, et al, Feb., 311
—symmetrical transformation zones (so-called Milkman's disease) (ab), G. H. Schmitt, April, 628
—treatment of leukemia and allied disorders with folic acid antagonists; effect of aminopterin on skeletal lesions, Frederic N. Silverman, May, 665

BONES—*cont.*
fractures. See Fractures
growth
—double contour, cupping and spurring in roentgenograms of long bones in infants (ab), Kurt Glaser, March, 463
—ossification centers of the lower limb in an infant of two years (ab), J. Poulhès, March, 464
—prevalence and distribution of ossification centers in the newborn infant (ab), Amos Christie, Feb., 301
—unfused ossification centers associated with pain in the adult (ab), Paul C. Swenson and Daniel Wilner, Feb., 300
syphilis
—osteoperiostitis—skull, ribs, and phalanges; case (ab), John W. Metcalfe, May, 784
tumors
—chondroblastic tumors: benign and malignant (ab), Murray M. Copeland and Charles F. Geschickter, April, 626
—difficulty of differential diagnosis between primary and secondary tumors (ab), Mauro Piemonte, Jan., 143
—eosinophilic granuloma (ab), B. Walthard and A. Zuppinger, June, 910
—eosinophilic xanthomatous granuloma with honeycomb lungs (ab), Thomas Parkinson, May, 771
—non-specific (eosinophilic) granuloma (ab), R. M. Hill, June, 911
—observations on lesions in Hodgkin's disease (ab), P. J. Moir and J. G. Brockis, March, 463
—osteoclastoma; 38 cases (ab), B. W. Windeyer and P. B. Woodyatt, April, 625
—osteogenic sarcoma—along what lines should it be treated? (ab), Erik Poppe, April, 632
—roentgen therapy of benign giant-cell tumor (ab), Franz Buschke and Simeon T. Cantril, Feb., 308
—secondary hemangioma; case (ab), J. A. White, June, 911
—treatment of giant-cell tumors, with review of 25 cases (ab), T. M. Prossor, April, 632
—treatment of osteoclastoma by radiation (ab), Frank Ellis, April, 632
BONOFF, CHESTER P.: Acute primary pulmonary blastomycosis, Feb., 157
BONORINO UDAONDO, C., RESANO, H., and D'ALOTTO, V.: Plummer-Vinson syndrome (ab), March, 457
BOOK REVIEWS
Arnell, Sigfrid. Myelography with Water-Soluble Contrast, with Special Regard to the Normal Roentgen Picture, Jan., 120
Baclesse, F. Carcinoma of the Larynx, June, 887
Behrens, Charles F., editor. Atomic Medicine, Jan., 121
Bertwistle, A. P. Descriptive Atlas of Radiographs, Jan., 120
Bibliography of Occupational Medicine, May, 757
de Lorimier, Alfred A. The Arthropathies. A Handbook of Roentgen Diagnosis, April, 605
di Rienzo, S. Radiologic Exploration of the Bronchus, Feb., 285
Fiol, C. Marina. Estudio Radiológico del Intestino Delgado, March, 436
Fossati, Franco. Radiologia Schermografica, Jan., 121
Glocker, Richard. Röntgen- und Radiumphysik für Mediziner, April, 606
Golden, Ross. Roentgen-Ray Examination of the Digestive Tract, Jan., 120
Graf, Herbert. Über die neuen Strahlenschutzregeln für die Herstellung und Errichtung medizinischer Röntgeneinrichtungen und -anlagen, DIN 6811 und 6812, Feb., 285
Greulich, Walter W., and Pyle, S. Idell. Radiographic Atlas of Skeletal Development of Hand and Wrist, June, 887
Heyman J., editor. Annual Report on the Results of Radiotherapy in Cancer of the Uterine Cervix, June, 888
Hohl, Kurt. Experimentelle Untersuchungen über Röntgeneffekte und chemische Effekte auf die pflanzliche Mitose, March, 437
Holthusen, H., editor. Aktuelle Probleme der Pathologie und Therapie, May, 757
Huizinga, Eelco, and Smelt, G. J.: Bronchography, May, 756
Ledoux-Lebard, R., and Ledoux-Lebard, Guy-R. Manuel de radiodiagnostic clinique, April, 605
Markovits, Emerik. Bone and Joint Radiology, Feb., 284
Pohle, Ernst A., editor. Clinical Radiation Therapy, April, 605
Ritvo, Max. Roentgen Diagnosis of Diseases of the Skull. Annals of Roentgenology, Vol. 19, April, 604
Rohr, Karl. Das menschliche Knochenmark, June, 888
Saupe, Erich. Die Röntgenbildanalyse. Eine röntgendiagnostische Anleitung fur Studierende und Ärzte, March, 437
Torkildsen, A. Carotid Angiography, with Special Reference to the Diagnosis of Cerebral Gliomas, May, 756
Turano, L. Diagnostica radiologica dell' apparato uropoietico, March, 437
BOOKS RECEIVED (not reviewed)
Adams, Douglas P., editor. An Index of Nomograms, May, 756
Berning, Heinrich. Die Dystrophie, Jan., 120
Böhm, F. Untersuchungen uber die Tuberkulose des Dünndarmes, June, 887
Cantor, Meyer O. Intestinal Intubation, Feb., 284
Ducuing, J., and Ducuing, L. Les tumeurs malignes des voies aéro-digestives supérieures, Feb., 284
Eickhoff, Wilhelm. Schilddrüse und Basedow, Beiträge zur Histo-Morphologie und Funktion der Schilddrüse verschiedener freilebender Tiere, Jan., 120
Grubbe, Emil H. X-Ray Treatment. Its Origin, Birth and Early History, Jan., 119
Hodges, Fred Jenner, Holt, John F., and Lampe, Isadore editors. The 1949 Year Book of Radiology, Jan., 119
Lacroix, Pierre. L'organisation des os, Feb., 284
Pfeifer, Walter. Grundlagen der funktionellen urologischen Röntgendiagnostik, Jan., 120
Rovner, Leopold. Infrared Radiation Therapy Sources and Their Analysis with Scanner, June, 886
Schinz, H. R., Baensch, W. E., Friedl, E., and Uehlinger, E. Lehrbuch der Röntgendiagnostik, June, 887
Schoen, Rudolf, and Tischendorf, Walter. Klinische Pathologie der Blutkrankheiten, June, 886
Simmons, Channing C., editor. Cancer. A Manual for Practitioners, June, 886
Sjögren, Torsten, and Larsson, Tage. Microphthalmos With or Without Coincident Oligophrenia. A Clinical and Genetic-Statistical Study, Feb., 284
Speijer, Bernard. Betekenis en Bepaling van de Skeletleeftijd, May, 756
Spurling, R. Glen. Practical Neurological Diagnosis, with Special Reference to the Problems of Neurosurgery, March, 436
Teschendorf, Werner. Lehrbuch der röntgenologischen Differentialdiagnostik, April, 605
Tidy, Sir Henry, and Short, A. Rendle, editors. The Medical Annual. A Year Book of Treatment and Practitioner's Index, Jan., 119
BOOTH, ALAN. See **PLAYFAIR, P. LYON**
BOOTH, ROBERT E. See **STADERMAN, ALBERT H.**
BORAK, J., ELLER, J. J., and ELLER, W. D.: Roentgen therapy for hyperhidrosis. Observations of one hundred and twenty-two patients (ab), May, 797
BOUCHARD, J. See **McCURRACH, A. C.**
BOWING, HARRY H., FRICKE, ROBERT E., and KENNEDY, THOMAS J.: Radium therapy for carcinoma of Bartholin's glands (ab), March, 472
BOYD, HAROLD B., and GRIFFIN, LAWRENCE L.: Classification and treatment of trochanteric fractures (ab), May, 786
BOYDEN, EDWARD A. See **BERG, ROGER M.**
——See **SMITH, FRANKLIN R.**
BRAESTRUP, CARL B. See **SHAFER, JUNE C.**
BRAGG, ERNEST A., Jr., and LEVENE, GEORGE: Hamartoma of the lung, Feb., 227
——See **LEVENE, GEORGE**
BRAIN
—diagnosis of intracerebral hematomas following frontal lobotomy (ab), Olof Sjöqvist, et al, June, 895
—methods of marking the plane of section in the open lobotomy operation, Benjamin B. Whitcomb and William B. Scoville, May, 741
—paraphysial cysts of third ventricle; 8 cases (ab), James Greenwood, Jr., Feb., 294
—roentgen diagnosis of herniation of brain into spinal canal (Arnold-Chiari deformity) by pantopaque myelography; case diagnosed preoperatively, Julian R. Lewin, Henry T. Wycis, and Barton R. Young, April, 591
blood supply. See also Aneurysm, cerebral; Arteries, carotid
—arteriography in cerebral vascular accidents (ab), I. S. Wechsler and S. W. Gross, May, 767
—cerebral angiography (ab), Lyle A. French and Paul S. Blake, June, 895
—experimental study of contrast media for cerebral angiography with reference to possible injurious effects on the cerebral blood vessels (ab), Tore Broman and Olle Olsson, May, 767
—improved vertical and horizontal multiple cassette changers for contrast angiography, John A. Campbell and Phillip B. Lockhart, April, 559
—percutaneous cerebral angiography and cerebral abscess (ab), H. F. Fabritius, et al, March, 445
—role of complete cerebral angiography in neurosurgery (ab), Rupert Raney, et al, April, 613
—simple radiographic technic for cerebral angiography, Lee S. Rosenberg and James R. Simpson, June, 869
—vertebral angiography (ab), Oscar Sugar, et al, Jan., 137
roentgenography. See also Brain, blood supply
—amyotonia congenita associated with occlusion of the sagittal sinus and bilateral subdural hygroma; demonstration of occlusion by diotrast sinography; case (ab), Michael Scott, Jan., 130
—some aspects of the technic of encephalography (ab), E. Lindgren, Jan., 130
tumors
—associated facial and intracranial hemangiomas (ab), Daniel F. Downing and Marshall B. Kreidberg, May, 767
—cerebral tumors (ab), M. H. Jupe, et al, June, 896
—uptake of radioactive phosphorus by malignant brain tumors (ab), Theodore C. Erickson, et al, May, 800
BRAMS, WILLIAM M. See **LEVINSON, LOUIS J.**
BRANTIGAN, O. C.: Cystic disease of the lung (ab), Jan., 135
BREAN, HENRY P., MARKS, JOSEPH H., SOSMAN, MERRILL C., and SCHLESINGER, MONROE J.: Massive calcification in infarcted myocardium, Jan., 33
BREAST
cancer
—carcinoma: present status of therapy (ab), Howard W. Jones, Jr., May, 793
—carcinoma: roentgen therapy by long focal distance irradiation (ab), R. Nadal, et al, May, 793

BREAST, cancer—*cont.*
—castration as a therapeutic measure in cancer of male breast (ab), Norman Treves, Feb., 307
—occurrence of herpes zoster in carcinoma (ab), Eugene P. Pendergrass and David Kirsh, May, 794
—postoperative radiotherapy, A. Tevfik Berkman, April, 572
—roentgen therapy alone in the treatment of operable and non-operable cancers (ab), M. Baclesse, May, 793
—treatment (Halsted amputation, radium seeding, radium-bearing corset; personal method) (ab), A. Jentzer and R Clerc, June, 921
—x-ray therapy of primary inoperable carcinoma, Ruth J. Guttmann, April, 567
BRECKENRIDGE, ROBERT L. See **WIRTS, C. WILMER**
BRICK, IRVING B.: Hiatus hernia and carcinoma of the stomach and esophagus (ab), June, 908
Incidence of hiatus hernia and associated lesions diagnosed by roentgen ray (ab), March, 456
BRINCOURT. See **PRUVOST, P.**
BRINEY, ALLAN K. See **TAYLOR, ASHTON B.**
BROCK, R. C. See **BAKER, CHARLES**
BROCKIS, J. G. See **MOIR, P. J.**
BRODIE, ALLAN G. See **ORTIZ, MANUEL HIGINIO**
BRODY, EDWIN R. See **KLINE, PAUL R.**
BROMAN, TORE, and OLSSON, OLLE: Experimental study of contrast media for cerebral angiography with reference to possible injurious effects on the cerebral blood vessels (ab), May, 767
BROMLEY, L. L., CRAIG, J. DONALDSON, and KESSEL, A. W. LIPMANN: Infected intervertebral disk after lumbar puncture (ab), Jan., 145
BRONCHI
See also Bronchiectasis; Foreign Bodies
—analysis of variations of segmental bronchi of left lower lobe of 50 dissected and 10 injected lungs (ab), Roger M. Berg, et al, March, 446
—analysis of variations of segmental bronchi of right lower lobe of 50 injected lungs (ab), Franklin R. Smith and Edward A. Boyden, March, 446
—ectopia (ab), William H. Falor and A. H. Kyriakides, March, 448
—peristalsis (ab), Felix G. Fleischner, June, 897
—syndrome of sinus and bronchial disease in children: its treatment by detergent antibiotics (ab), Emilio Alemán, April, 614
—tomographic demonstration of broncholiths (ab), Ernst Theilkäs, Feb., 297
cancer
—carcinoma: an unusual radiological finding (ab), F. Greenwood and W. L. Phillips, March, 452
—diagnosis of carcinoma by means of tomography (ab), Anni Stangl, June, 899
roentgenography
—bronchography: methods by which it may be performed and factors influencing choice of method (ab), Anthony A. Vickers, March, 447
—delayed pneumonia and urticaria following bronchography (ab), H. E. Bass, March, 448
—discretion in use of bronchography (ab), Richard H. Overholt and Beatty H. Ramsey, May, 769
—laryngo-tracheo-bronchial anesthesia for bronchoscopy and bronchography with pontocaine (ab), A. Albert Carabelli, April, 614
—observations in collapsed lungs (ab), A. Arquimedes R. Diaz, June, 898
—useful procedure in tomographic exploration (ab), René Jeanneret, et al, May, 770
tuberculosis
—of trachea and major bronchi; results of treatment with streptomycin (ab), Arthur M. Olsen and H. Corwin Hinshaw, June, 899
tumors
—carcinoid (adenoma) (ab), Claus Esser, April, 616
BRONCHIECTASIS
—apical bronchiectasis (ab), P. Pruvost, et al, May, 770
BROOKE, WALLACE S. See **GAZIN, ALBERT I.**
BROTHERS, GEORGE B. See **BRUCE, ROBERT A.**
BROWN, J. R. See **LIND, DAVID A.**
BROWN, JAMES B., McDOWELL, FRANK, and FRYER, MINOT P.: Surgical treatment of radiation burns (ab), April, 637
BROWN, PHILIP W. See **MAYO, CHARLES W.**
BROWNING, ETHEL: Blood changes in luminizers using radioactive material (ab), Feb., 312
BRUCE, ROBERT A., LOVEJOY, FRANK W., Jr., BROTHERS, GEORGE B., and VELASQUEZ, TULIO: Observations on the causes of dyspnea in chronic pulmonary granulomatosis in beryllium workers (ab), March, 450
BRUES, AUSTIN M. See **PAINTER, ELIZABETH E.**
BRUSKEWITZ, HAROLD W., and EWELL, GEORGE H.: Osteoporosis of the pelvic bones (acute bone atrophy of Sudeck) (ab), May, 785
BÜCKER, J.: Radiographic manifestation of hyperplastic gastritis (ab), April, 621
BÜHLMANN, A. See **ROSSIER, P. H.**
BUIE, LOUIS A. See **CRAIG, MARION S., Jr.**
BULEY, H. M. See **ALBERS, EDWARD C.**
BULL, J. W. D.: Diagnosis of chronic subdural haematoma in children and adolescents (ab), Jan., 130
BUNNER, R.: Angiographic studies of the cerebral vessels in arteriovenous aneurysms (ab), Feb., 294
BUNTS, R. CARL. See **TALBOT, HERBERT S.**
BURCH, GEORGE E., THREEFOOT, SAM A., and CRONVICH, JAMES A.: Theoretic considerations of biologic decay rates of isotopes (ab), Jan., 154
——See **THREEFOOT, SAM A.**
BURGER, G. C. E.: Perceptibility of details in roentgen examinations of the lung (ab), Feb., 295
BURKE, DESMOND T.: A stereoscopic viewing desk designed for limited space, May, 750
BURKE, M. H., SCHENCK, H. C., and THRASH, J. A.: Tuberculosis studies in Muscogee County, Georgia. II. X-ray findings in a community-wide survey and its coverage as determined by a population census (ab), Feb., 295
BURNS. See Roentgen Rays, injurious effects
BURSA. See Knee; Shoulder
BURTON, A. C. See **CAMPBELL, B. A.**
BUSBY, TRENT. See **ANDERSON, GEORGE W.**
BUSCHKE, FRANZ, and CANTRIL, SIMEON T.: Roentgen-therapy of benign giant-cell tumor of bone (ab), Feb., 308
BUSH, F.: Rotational roentgen therapy in the horizontal plane. Part III. Theoretical considerations (ab), April, 634
BYRON, FRANCIS X., ALLING, EMERY E., and SAMSON, PAUL C.: Intrathoracic meningocele (ab), May, 776

C

CAINE, JAMES C.: Epidemic pulmonary disease (ab), June, 903
CALCANEUM
—unicameral cyst (ab), Robert G. Dunn, Jr., Jan., 147
CALCIFICATION
See also Heart; Kidneys; Lungs
—calcinosis; case (ab), William L. Wingfield and Elam C. Toone, Jr., April, 625
CALCIUM
See also Calcification; Shoulder
—masked steatorrhea revealed by pseudofractures (Looser's zones) with some observations on calcium excretion in convalescence (ab), J. R. Nassim and N. H. Martin, June, 912
—method for the quantitative roentgenological determination of the amount of calcium salts in bone tissue: its use in the study of calcium reduction in the phalanges of the fingers in chronic polyarthritis (ab), Arne Engström and Sölve Welin, May, 783
CALHOUN, JOSEPH D. See **MESCHAN, ISADORE**
CAMP, JOHN D.: Contrast myelography past and present. Carman lecture, April, 477
CAMPBELL, B. A., and BURTON, A. C.: Stratification of bile in the gall bladder and cholelithiasis (ab), May, 783
CAMPBELL, HAROLD W. See **COCHRANE, ARCHIBALD L.**
CAMPBELL, JOHN A., and LOCKHART, PHILLIP B.: Improved vertical and horizontal multiple cassette changers for contrast angiography, April, 559
CAMPBELL, MAURICE. See **BAKER, CHARLES**
CAMPBELL, MEREDITH F.: Radiologic diagnosis of urinary tract tumors in infants and children, May, 646
CANCER
See also under names of organs
—cancer problem; presidential address (ed), Edgar P. McNamee, March, 430
—postgraduate course in diagnosis and therapy, June, 886
—tumor clinic as a study group, F. G. Stuart, Feb., 263
experimental. See Tumors, experimental
in children
—carcinoma of the thyroid: a 10-year follow-up, Hugh F. Hare and Richard V. Newcomb, March, 401
—multiple basal-cell epitheliomas in a 5-year-old child (ab), Isabel M. Scharnagel and George T. Pack, April, 636
metastases. See also Lungs, cancer; Lymph Nodes, cancer
—metastatic carcinoma of the ureter in carcinoma of cervix (ab), Leo S. Drexler, Jan., 149
—symposium on cancer of the cervix. The dispersion of cancer of the cervix, Erle Henriksen, June, 812
multiple
—multiple carcinomas of the large bowel, Richard H. Marshak, May, 729
radiotherapy
—factors influencing response of cancer to radiation (ab), Constance A. P. Wood, June, 919
—on the multiple possibilities of a long-life artificially radioactive isotope (Co^{59}), in fluid form (ab), J. H. Müller, June, 925
—present status of radiotherapy and radioisotopes in treatment (ab), M. Weinbren, June, 919
—study of connective-tissue reaction to radiation: the sieve or chess method (ab), B. Jolles, March, 476
—symposium on small field therapy for deep-seated tumors (ab), P. R. Steed, et al, March, 470
—treatment of cancer: radiological analysis of Prof. J. van Roojen's report on the treatment of an experimental clinical series (ab), M. Weinbren, March, 470
CANTOR, MEYER O.: Radiological criteria for removal of intestinal decompression tube, April, 535
CANTRIL, SIMEON T. See **BUSCHKE, FRANZ**
CAPLAN, MAX, and SHERWOOD, PAUL M.: Cardiac aneurysm (ab), March, 453
CARABELLI, A. ALBERT: Laryngo-tracheo-bronchial anesthesia for bronchoscopy and bronchography with pontocaine (ab), April, 614

CARBON DIOXIDE
—CO_2 and air as antispasmodics (ab), Paul Cave, March, 457
CARCINOID. See Bronchi, tumors; Stomach, tumors
CARCINOMA. See Cancer and under names of organs
CARCINOSARCOMA. See Tumors, mixed
CARDIA. See Stomach
CARDIOVASCULAR SYSTEM
See also Aorta; Ductus Arteriosus; Heart
—angiocardiography in the differential diagnosis of pulmonary neoplasms (ab), Harold Neuhof, et al, Jan., 135
—angiocardiography: its clinical and radiological interest, (ab), P. Thoyer-Rozat and J. Piequet, June, 905
—clinical angiocardiography: critical analysis of indications and findings (ab), Charles T. Dotter and Israel Steinberg, June, 904
—death following angiocardiography, Charles T. Dotter and Frederic S. Jackson, April, 527
—development of the tautograph and advantages of automatization in cardiovascular angiography (ab), Wendell G. Scott and Sherwood Moore, June, 918
—improved vertical and horizontal multiple cassette changers for contrast angiography, John A. Campbell and Phillip B. Lockhart, April, 559
—retrograde arteriography in diagnosis of cardiovascular lesions: visualization of aneurysms and peripheral arteries (ab), Norman E. Freeman and Earl R. Miller, Jan., 137
CARLSON, EVERETT, CLARK, ALBERT G., and WALSTAD, PAUL M.: Diagnosis of intestinal obstruction in the newborn. Review of the literature with a report of eight additional cases (ab), March, 461
CARMODY, MORRIS G. See **DeNARDI, JOSEPH M.**
CARPENDER, JAMES W. J. See **LAWRENCE, JOHN H.**
CARPUS. See Scaphoid, Bone, Carpal; Wrist
CARROLL, WYNTON H.: Roentgen manifestations of acute and healed toxoplasmic encephalomyelitis, April, 554
CARSON, MERL J., and GOODFRIEND, JAMES: Constricting vascular rings. Report of two cases with recurrent respiratory infections (ab), Jan., 136
CARTILAGE
—roentgen treatment of cutaneous carcinoma involving cartilage (ab), Leo M. Levi, Feb., 307
CARTWRIGHT, GEORGE E.: An unusual case of clonorchiasis with marked eosinophilia and pulmonary infiltrations (ab), Jan., 134
de CARVALHO, LOPO. See **AYRES de SOUSA**
CASHMAN, B. Z., and HELSEL, E. V.: Treatment of advanced carcinoma of the ovary (ab), Feb., 307
CASTRATION
—as therapeutic measure in cancer of male breast (ab), Norman Treves, Feb., 307
CATLOW, CHARLES E. See **POTAMPA, PHILLIP B.**
CAUDA EQUINA. See Spinal Cord
CAVE, PAUL: Use of CO_2 and air as antispasmodics (ab), March, 457
CECUM. See Intestines
CEPHALOMETRY. See Craniometry
CEREBROSPINAL FLUID
—distention of the subarachnoid space with cerebrospinal fluid in infants; enlargement of the head and spasticity; surgical correction (ab), Charles Bagley, Jr., et al, April, 613
CEREBRUM. See Brain
CHALEK, JACK I. See **LINSMAN, JOSEPH F.**
CHAMPION, A. N.: Irradiation of the nasopharynx (ab), Feb., 309
CHAPMAN, WILLIAM H. See **CRONKITE, EUGENE P.**
CHARLES, A. H. See **GILMOUR, MARY D.**
CHASSARD-LAPINÉ POSITION. See Pelvis, measurement
CHASSIN, JAMESON L., and HINTON, J. WILLIAM: Primary carcinoma of the duodenal bulb mimicking duodenal ulcer (ab), Jan., 140
CHATTERTON, C. C.: Radiographic evidence of intermittent protrusion of an intervertebral disc (ab), June, 913
CHATTON, P.: A study of the failures in contact roentgen therapy of skin cancers (ab), May, 792
——MALÉKI, A., and JOHANNSEN, H.: Value of the lateral view in tomography of the thorax (ab), March, 447
CHAVES, AARON D.: Incipient pulmonary tuberculosis in persons over forty (ab), April, 614
CHENEY, CHARLES B. See **THOMS, HERBERT**
CHESS METHOD. See Cancer, radiotherapy
CHIKIAMCO, PATERNO S.: An unusual role of roentgenology in the diagnosis of malignant lesion of the stomach (report of a case) (ab), April, 621
CHILDREN
See also Bones, growth; Cancer, in children; Heart, abnormalities; Infants, Newborn
—coccidioidomycosis: case studies in children (ab), Robert Cohen, May, 771
—congenital cystic disease of lungs in infants and children (ab), Mark M. Ravitch and Janet B. Hardy, June, 898
—diagnosis of chronic subdural hematoma in children and adolescents (ab), J. W. D. Bull, Jan., 130
—distention of the subarachnoid space with cerebrospinal fluid in infants: enlargement of the head and spasticity; surgical correction (ab), Charles Bagley, Jr., et al, April, 613
—fibrosis of pancreas in infants and children: an illustrated review of certain clinical features with special emphasis on pulmonary and cardiac aspects (ab), Charles D. May and Charles U. Lowe, May, 776
—leukemia in childhood; a clinical and roentgen study of 72 cases (ab), John H. Dale, Jr., May, 787
—lymphatic radiotherapy in infancy (ab) D. Cirillo, March, 473
—normal roentgenogram of the chest in infants and children (ab), John R. Hodgson, April, 614
—on growth of human head from birth to the third month of life (ab), Manuel Higinio Ortiz and Allan G. Brodie, March, 445
—radiologic diagnosis of urinary tract tumors in infants and children, Meredith F. Campbell, May, 646
—radiologic images which simulate pulmonary tuberculosis in children (ab), José M. Mir, Feb., 295
—radiologic study of mastoid bone in infants in conjunction with anatomic and pathologic investigations (ab), Henry G. Koiransky, et al, May, 768
—recommendation of American Academy of Pediatrics on radioactive isotopes, May, 755
—roentgen examination of the larynx of children suffering from false croup (ab), Sven R. Kjellberg, Jan., 131
—roentgen manifestations of infantile hypertrophic pyloric stenosis (ab), Herbert M. Olnick and H. Stephen Weens, May, 779
—syndrome of sinus and bronchial disease: its treatment by detergent antibiotics (ab), Emilio Alemán, April, 614
—ureteral reflux in the normal child (ab), H. M. Gibson, June, 918
—x-ray interpretation of pulmonary tuberculosis in childhood (ab), Colin Macdonald, Jan., 132
CHOISSER, ROGER M., and MONTGOMERY, ROBERT R.: Gaucher's disease in a Negro. Case (ab), May, 787
CHOLANGIOGRAPHY. See Biliary Tract
CHOLANGITIS. See Biliary Tract
CHOLECYSTITIS. See Gallbladder
CHONDROBLASTOMA. See Bones, tumors
CHONDRO-OSTEO-DYSTROPHY. See Dyschondroplasia
CHORDOMA. See Tumors, chordoma
CHREST, CLARENCE P. See **LAMPE, ISADORE**
CHRISMAN, O. D., and SHORTELL, J. H.: Fractures of the distal end of the radius complicated by fractures of the carpal scaphoid (ab), June, 914
CHRISTIE, AMOS: Prevalence and distribution of ossification centers in the newborn infant (ab), Feb., 301
CHU, FLORENCE. See **GOTTLIEB, CHARLES**
CHURCHILL, EDWARD D.: Segmental and lobular physiology and pathology of the lung (ab), May, 769
CHURG, J., and ROSENBAUM, M.: Congenital hemolytic jaundice in a Negro family (ab), March, 446
CIRCULATION. See Blood, circulation; Blood Vessels; Extremities; Lungs, blood supply
CIRILLO, D.: Lymphatic radiotherapy in infancy (ab), March, 473
CLAGETT, O. THERON. See **EATON, L. M.**
——See **JOHNSON, CLIVE R.**
CLAMAN, Z. B. See **PORTER, H. W.**
CLARK, ALBERT G. See **CARLSON, EVERETT**
CLARK, WILLIAM G., and UNCAPHER, REX P.: Dosage-mortality in rats given total body roentgen irradiation (ab), May, 802
CLAVICLE
—retrosternal dislocation (ab), John C. Kennedy, Jan., 146
CLAY
—lead-containing clay for shielding in roentgen ray treatment of skin (ab), Robert Kaldeck, May, 792
CLERC, R. See **JENTZER, A.**
CLINE, F., Jr. See **ABSHER, W. K.**
CLONORCHIASIS
—with marked eosinophilia and pulmonary infiltrations; unusual case (ab), George E. Cartwright, Jan., 134
COBALT
See also Radioactivity
—precision wave-length measurements of the 1.1 and 1.3 Mev lines of Co60 with the two meter focusing curved-crystal spectrometer (ab), David A. Lind, et al, April, 635
COCCIDIOIDOMYCOSIS
—case studies in children (ab), Robert Cohen, May, 771
—coexisting disseminated coccidioidomycosis and tuberculosis; case (ab), George M. Firestone and Ellis S. Benson, March, 451
—correlated study of tuberculin, histoplasmin and coccidioidin sensitivities with pulmonary calcifications in the Rocky Mountain area (ab), W. K. Absher and F. Cline, Jr., May, 771
—observations on primary coccidioidomycosis (ab), Ashton B. Taylor and Allan K. Briney, June, 901
—recognition of late pulmonary residuals (ab), Randolph P. Pillow and Theodore E. Finnegan, June, 901
COCHRANE, A. L. See **FLETCHER, C. M.**
COCHRANE, ARCHIBALD L., CAMPBELL, HAROLD W., and STEIN, SAMUEL C.: Value of roentgenology in the prognosis of minimal tuberculosis (ab), Jan., 133
COFFEY, JOHN D., Jr., and SALMON, DAVID D.: Cooley's erythroblastic anemia in a Negro girl (ab), May, 787
COHEN, ARCHIBALD C.: Tuberculosis and carcinoma of the lung (ab), April, 615
COHEN, HYMAN L. See **EPSTEIN, BERNARD S.**
COHEN, LIONEL: Clinical radiation dosage (ab), Feb., 310
COHEN, RAYMOND C.: Cough fracture of ribs (ab), Jan., 146
COHEN, ROBERT: Coccidioidomycosis. Case studies in children (ab), May, 771
COHEN, SANDER. See **FELSON, BENJAMIN**
COHEN, SIDNEY. See **ASHER, LEONARD M.**

COLCHER, A. E., and SUSSMAN, WALTER: Changing concepts of x-ray pelvimetry (ab), Feb., 303
COLITIS
—involvement of the ileum in chronic ulcerative colitis (ab). Fred J. McCready, et al, Jan., 151
COLON
See also Colitis; Colostomy
—study of the colon of apparently well women (ab), Marie Ortmayer and Marie Connelly, April, 622
cancer
—carcinoma of ascending colon; case (ab), Richard S. Silvis, June, 908
—diagnosis of cancer of large bowel (ab), Neil W. Swinton, et al, May, 782
—multiple carcinomas of the large bowel, Richard H. Marshak, May, 729
roentgenography. See Intestines, roentgenography
COLOSTOMY
—device for roentgen examination of the colon following colostomy, Joseph C. Root and Albert A. Rayle, Jr., May, 732
COLUMBIUM. See Radioactivity
COLVIN, G. S. See **PARKE, W.**
COMSTOCK, GEORGE W.: Tuberculosis studies in Muscogee County, Georgia. I. Community-wide tuberculosis research, Feb., 295
CONDON, WILLIAM B. See **HARPER, FRED R.**
CONGRESS OF RADIOLOGY, Argentina (Second), Feb., 283
CONNELLY, MARIE. See **ORTMAYER, MARIE**
CONTRAST MEDIA
See also Barium; Iodine and Iodine Compounds; Thorium Dioxide
—experimental study of contrast media for cerebral angiography with reference to possible injurious effects on the cerebral blood vessels (ab), Tore Broman and Olle Olsson, May, 767
—hyaluronidases as a factor hastening the spread and absorption of water-soluble radiopaque substances deposited intracutaneously, subcutaneously, or intramuscularly (ab), Olle Olsson and Olov Löfgren, Feb., 306
COODLEY, EUGENE L., and KERT, MORLEY J.: Sickle cell disease simulating advanced rheumatoid arthritis. Report of a case (ab), May, 787
COOKSON, HAROLD: Mitral stenosis in later life (ab), March, 456
COOLEY, ROBERT N., SLOAN, ROBERT D., HANLON, C. ROLLINS, and BAHNSON, HENRY T.: Angiocardiography in congenital heart disease of cyanotic type. II. Observations on tricuspid stenosis or atresia with hypoplasia of the right ventricle, June, 848
COOLEY'S ANEMIA. See Anemia, erythroblastic
COOPER, F. W., ELKIN, DANIEL C., SHEA, PATRICK C., and DENNIS, E. W.: Study of peripheral vascular disease with radioactive isotopes (ab), May, 799
COOPER, GEORGE, Jr., and FRANKEL, CHARLES J.: Diagnosis and treatment of carpal injuries (ab), June, 913
COPELAND, MURRAY M., and GESCHICKTER, CHARLES F.: Chondroblastic tumors of bone: benign and malignant (ab), April, 626
——and GREINER, D. JAMES: Lymphosarcoma of the duodenum. Report of a case; Review of literature (ab), March, 460
COR PULMONALE. See Heart, hypertrophy
CORAY, Q. B. See **HICKEN, N. FREDERICK**
CORDAY, ELIOT. See **PRINZMETAL, MYRON**
CORNET, PAUL. See **HICKEL, RICHARD**
CORNWALL, CHARLES R. See **HICKEN, N. FREDERICK**
CORONEL VERA, J. A. See **GINES, ANGEL R.**
COSBY, RICHARD S., and GRIFFITH, GEORGE C.: Interatrial septal defect (ab), June, 905
COSIN, L. See **JUNGMANN, H. J.**
COSTOLOW, WILLIAM E. See **NOLAN, JAMES F.**
COUGH
—cough fracture in late pregnancy (ab), J. W. Paulley, et al, Jan., 146
—cough fracture of ribs (ab), Raymond C. Cohen, Jan., 146
COURTER, SANFORD R. See **FELSON, BENJAMIN**
COUTARD, HENRI (obit), May, 758
COVE, ARTHUR M., and CURPHEY, WILFRED C.: Prolapse of redundant gastric mucosa (ab), Jan., 139
CRADDOCK, CHARLES G., VALENTINE, WILLIAM N., and LAWRENCE, JOHN S.: The lymphocyte. Studies on its relationship to immunologic processes in the cat (ab), Jan., 156
——See **VALENTINE, WILLIAM N.**
CRAIG, J. DONALDSON. See **BROMLEY, L. L.**
CRAIG, MARION S., Jr., and BUIE, LOUIS A.: Factitial (irradiation) proctitis. A clinicopathologic study of 200 cases (ab), Feb., 311
CRANDELL, WALTER B. See **GRANT, AUSTIN R.**
CRANIOFENESTRIA. See Cranium
CRANIOMETRY
—on the growth of the human head from birth to third month of life (ab), Manuel Higinio Ortiz and Allan G. Brodie, March, 445
—simplified method of fetal roentgencephalometry; results checked in 482 cases (ab), Richard Torpin and J. L. Allgood, Jr., Feb., 304
CRANIUM
See also Frontal Bone; Occipital Bone; Sphenoid Bone; Temporal Bone
—lacuna skull and craniofenestria (ab), C. van Waalwijk van Doorn and J. N. Boet, Feb., 293
—osteoporosis circumscripta cranii (osteoporosis circumscripta of Schüller) (ab), F. Lepennetier and R. Grain, May, 768
—perforation of gastric ulcer associated with intracranial hemorrhage in a newborn infant, Charles Gottlieb, Florence Chu, and Herbert S. Sharlin, April, 595
fractures
—mechanism of skull fracture, E. S. Gurdjian, J. E. Webster, and H. R. Lissner, March, 313
—traumatic pneumocephalus, Earl E. Barth and George E. Irwin, Jr., March, 424
roentgenography
—convolutional markings in roentgenograms of patients with headache (ab), Leo M. Davidoff and Harvey Gass, Feb., 293
—roentgen findings in intracranial mass lesions (ab), J. George Teplick and Philip Dorsey, May, 767
syphilis
—osteoperiostitis—skull, ribs, and phalanges; case (ab), John W. Metcalfe, May, 784
tuberculosis
—caries cranii (tuberculosis of flat bones of vault of skull) (ab), A. C. de Vet, June, 897
tumors
—primary hemangioma: a rare cranial tumor. Review of literature and report of case, with special reference to roentgen appearances (ab), B. D. Wyke, Feb., 293
CREEPING ERUPTION
—case with Loeffler's syndrome (ab), Samuel H. Horton, Jr., June, 903
CROCKETT, K. A. See **RICHARDS, G. G.**
CRONKITE, EUGENE P.: Clinical manifestations of acute radiation illness in goats; comments on therapy (ab), Feb., 312
Ionizing radiation injury: its diagnosis by physical examination and clinical laboratory procedures (ab), May, 801
——and CHAPMAN, WILLIAM H.: A critical analysis of the syndrome of acute total body radiation illness, its role in atomic warfare and its influence on the future practice of military medicine (ab), Jan., 155
——ULLRICH, F. W., ELTZHOLTZ, D. C., SIPE, C. R., and SCHORK, P. K.: Response of the peripheral blood of swine to whole body x-ray radiation in the lethal range (ab), April, 637
CRONVICH, JAMES A. See **BURCH, GEORGE E.**
CROSBY, R. M. N. See **BAGLEY, CHARLES, Jr.**
CROSS, JAMES H. See **GIBBEL, MELVIN I.**
CROUCH, WILLIAM H. See **MASON, EDWARD F.**
CROUP
—roentgen examination of the larynx of children suffering from false croup (ab), Sven R. Kjellberg, Jan., 131
CROWLEY, JOSEPHINE. See **SCOTT, KENNETH G.**
CURPHEY, WILFRED C. See **COVE, ARTHUR M.**
CURRERI, A. R., and GALE, J. W.: Mediastinal tumors (ab), May, 775
CUSHING SYNDROME
—Cushing's disease—pituitary basophilism. Caldwell lecture, 1947 (ab), Merrill C. Sosman, June, 920
CUTTER, HAROLD C., FALLER, WILLIAM W., STOCKLEN, JOSEPH B., and WILSON, WILLIAM L.: Benign pneumoconiosis in a tin oxide recovery plant (ab), April, 616
CYANOSIS. See Heart, abnormalities
CYCLOTRON
—observations on the blood of cyclotron workers (ab), M. Ingram and S. W. Barnes, Jan., 156
CYSTITIS EMPHYSEMATOSA. See Bladder
CYSTS. See Adrenals; Brain; Calcaneum; Kidneys; etc.

D

DACK, SIMON. See **MASTER, ARTHUR M.**
D'AGOSTINO, JOSEPH V., LEVIN, CYRIL M., and WAINERDI, HAROLD R.: Uniumbilical-dibrachi-dicephalic monster: roentgenographic diagnosis in utero, delivery by low classical cesarean section (ab), Feb., 305
DALE, JOHN H., Jr.: Leucemia in childhood. A clinical and roentgenographic study of 72 cases (ab), May, 787
D'ALOTTO, V. See **BONORINO UDAONDO, C.**
DAMMANN, J. F., Jr., GIBSON, STANLEY, and POTTS, WILLIS J.: Observations on 117 patients operated on for congenital pulmonary stenosis (ab), April, 619
DANCOFF, S. M. See **QUASTLER, H.**
DARGENT, M., PAPILLON, J., and GUINET, P.: Radiosensitization of thyroid epitheliomas by amino-thiazol (ab), June, 921
DAUT, R. V., and DUNN, J. HARTWELL: Vasomotor response to the intravenous administration of neo-iopax for urograms (ab), May, 789
DAVIDOFF, LEO M., and GASS, HARVEY: Convolutional markings in the skull roentgenograms of patients with headache (ab), Feb., 293
DAVIES, C. E., and STEINER, R. E.: Calcified aortic valve Clinical and radiological features (ab), March, 454
DAVIES, I. See **FLETCHER, C. M.**
DAVIS, CARL B., Jr. See **GASUL, BENJAMIN M.**
DAVIS, DAVID M.: Diagnosis of renal tumors in the adult, May, 639
DAVISON, ROLAND A., KOETS, PETER, and KUZELL, WILLIAM C.: Effect of roentgenotherapy on urinary 17-ketosteroid excretion in ankylosing spondylarthritis (ab), Jan., 153

DAWSON, GEORGE H., Jr.: Intra-uterine fractures of the tibia and fibula: report of a case with correction by osteotomy and plating (ab), March, 464
DEAFNESS
—radiation therapy for conductive deafness: results and discussion of roentgen and radium irradiation (ab), Harry C. Rosenberger, April, 633
DE BACKER, JEAN: Contribution to the study of contact roentgen therapy (ab), June, 919
DECKER, HENRY G., and LIVINGSTON, KENNETH E.: Spinal extradural cyst (ab), April, 628
DEFICIENCY DISEASES
—small intestinal pattern in sprue and similar deficiency diseases (ab), Alice Ettinger, April, 622
DEHLINGER, KLAUS, and RIEMENSCHNEIDER, PAUL: Pulmonary embolism: analysis of 74 autopsy cases since 1941 (ab), March, 452
——See **NEUHAUSER, EDWARD B. D.**
de LAMBERT, R. M.: Radiological interpretation and pulmonary tuberculosis in the adult (ab), Jan., 132
DeLISA, DOMINICK A.: Squamositis, mastoiditis and squamomastoiditis (ab), April, 613
DELL, JAMES M., Jr.: Demonstration of sinus tracts, fistulas, and infected cavities by lipiodol (ab), Jan., 150
DeNARDI, JOSEPH M., VAN ORDSTRAND, H. S., and CARMODY, MORRIS G.: Acute dermatitis and pneumonitis in beryllium workers: review of 406 cases in 8-year period with follow-up on recoveries (ab), May, 772
DENNIS, E. W. See **COOPER, F. W.**
DENOUN, P. See **NADAL, R.**
DERMATITIS
—acute dermatitis and pneumonitis in beryllium workers; review of 406 cases in 8-year period with follow-up on recoveries (ab), Joseph M. DeNardi, et al, May, 772
DESOXYCORTICOSTERONE ACETATE. See Adrenal Preparations
DEUEL, HERBERT: Radium therapy of carcinoma of the uterine body (ab), Feb., 307
de VET, A. C.: Caries cranii (tuberculosis of the flat bones of the vault of the skull) (ab), June, 897
DEWAR, F. P. See **McKENZIE, K. G.**
DEXTROCARDIA. See Heart
DIABETES INSIPIDUS
—eosinophilic xanthomatous granuloma with honeycomb lungs (ab), Thomas Parkinson, May, 771
DIAGNOSIS. See Roentgen Rays, diagnosis
DIAPHRAGM
—hepato-diaphragmatic interposition of the small intestine, Joseph F. Linsman and Jack I. Chalek, May, 726
hernia. See Hernia
DIAPHYSIAL ACLASIS. See Dyschondroplasia
DIASTEMATOMYELIA. See Spinal Cord
DIAZ, A. RODRIGUEZ, and ANIDO, H.: Tetralogy of Fallot: surgical treatment (ab), May, 778
DIAZ, ARQUIMEDES RAMOS: Bronchographic observations in collapsed lungs (ab), June, 898
DiLEO, J. L., KUKER, L. H., and SHEPARD, R. M.: Prolapse of gastric mucosa into the duodenum. Case report and analysis of reported cases (ab), Feb., 299
DILLON, BEATRICE. See **von SALLMANN, LUDWIG**
DIVERTICULA. See Bladder; Duodenum; Intestines
DIXON, JOSEPH M. See **MILES, PAUL M.**
DOBSON, ERNEST L., GOFMAN, JOHN W., JONES, HARDIN B., KELLY, LOLA S., and WALKER, LEONARD A.: Studies with colloids containing radioisotopes of yttrium, zirconium, columbium, and lathanum. II. Controlled selective localization of radioisotopes of yttrium, zirconium, and columbium in the bone marrow, liver, and spleen (ab), Feb., 311
DOCKERTY, MALCOLM B. See **McANALLY, A. K.**
——See **McCREADY, FRED J.**
DOIG, A. T.: Industrial siderosis (ab), June, 902
DONAHUE, CHARLES D.: Osteitis of the spine (ab), Jan., 144
DONHAUSER, J. L., and ATWELL, S.: Volvulus of the cecum, with a review of one hundred cases in the literature and a report of six new cases (ab), Jan., 141
DOOLAN, PAUL D. See **ROSE, JOSEPH**
DORAN, F. S. A., and LONSDALE, W. H.: A simple experimental method of evaluation for the Bassini and allied types of herniorrhaphy (ab), March, 457
DORSEY, PHILIP. See **TEPLICK, J. GEORGE**
DOSAGE. See Radiotherapy; Radium; Roentgen Therapy; Uterus, cancer
DOTTER, CHARLES T., HARDISTY, NORRIS M., and STEINBERG, ISRAEL: Anomalous right pulmonary vein entering vena cava: two cases diagnosed during life by angiocardiography and cardiac catheterization (ab), June, 906
——**and JACKSON, FREDERIC S.:** Death following angiocardiography, April, 527
——**and STEINBERG, ISRAEL:** Angiocardiographic study of the pulmonary artery (ab), May, 778
Clinical angiography: a critical analysis of the indications and findings (ab), June, 904
DOUBILET, HENRY. See **RYAN, JOHN D.**
DOWNING, DANIEL F., and KREIDBERG, MARSHALL B.: Associated facial and intracranial hemangiomas (ab), May, 767
DREYFUSS, M. L.: Congenital sarcoma (ab), April, 631
DREXLER, LEO S.: Metastatic carcinoma of the ureter in carcinoma of the cervix (ab), Jan., 149
DRUCKMANN, A., and SCHORR, S.: Roentgenographic observation of perforation of the kidney following retrograde pyelography (ab), May, 790
DUCHÊNE. See **DUROUX, A.**
DUCTUS ARTERIOSUS
—radiokymography in patent ductus arteriosus (ab), K. Shirley Smith and Franklin G. Wood, June, 905
DUFRESNE, ORIGÈNE: Roentgentherapy of pain (ab), Feb., 310
DUISENBERG, CHARLES E.: The semiautomatic rapid film changer: its use in radiography and the recording of rapid physiological movements (ab), Feb., 306
DuMOND, JESSE W. M. See **LIND, DAVID A.**
DUNN, J. HARTWELL. See **DAUT, R. V.**
DUNN, ROBERT G., Jr.: Unicameral cyst of the calcaneus (ab), Jan., 147
DUNPHY, J. E., and ILFELD, FREDERIC W.: Fat embolism (ab), May, 788
DUNSTAN, EDGAR M., LOWANCE, MASON I., and JONES, EUGENIA C.: Clinical importance of duodenal diverticula (ab), May, 780
DUODENAL TUBE
—radiological criteria for removal of intestinal decompression tube, Meyer O. Cantor, April, 535
DUODENUM
—prolapse of gastric mucosa into duodenum; case; analysis of reported cases (ab), J. L. DiLeo, et al, Feb., 299
cancer
—primary carcinoma of bulb mimicking duodenal ulcer (ab), Jameson L. Chassin and J. William Hinton, Jan., 140
diverticula
—clinical importance (ab), Edgar M. Dunstan, et al, May, 780
fistula. See Fistula, renoduodenal
tumors
—lymphosarcoma; case; review of literature (ab), Murray M. Copeland and D. James Greiner, March, 460
—multiple lipomas (ab), N. W. Fawcett, et al, March, 460
ulcers. See Peptic Ulcer
DUROUX, A., and DUCHÊNE: Abnormal radiologic pulmonary image in course of secondary syphilis (ab), May, 774
DuSAULT, LUCILLE. See **NOLAN, JAMES F.**
DUVAL, F.: Treatment of ankylosing spondylitis and osteoarthritis (ab), Feb., 309
DYSCHONDROPLASIA
—chondro-osteo-dystrophy. Morquio-Brailsford type (ab), H. A. Thomas Fairbank, April, 624
—diaphysial aclasis (ab), H. A. Thomas Fairbank, Jan., 143
DYSPHAGIA
—dysphagia and mitral valve deformity (ab), Abraham Gootnick, Feb., 298
—Plummer-Vinson syndrome (ab), C. Bonorino Udaondo, et al, March, 457
DYSPLASIA EPIPHYSIALIS PUNCTATA. See Epiphyses
DYSPLASIA, MONOSTOTIC FIBROUS. See Ribs
DYSPLASIA, POLYOSTOTIC FIBROUS. See Bones
DYSPNEA
—causes of dyspnea in chronic pulmonary granulomatosis in beryllium workers (ab), Robert A. Bruce, et al, March, 450
DYSTROPHY. See Bones

E

EATON, L. M., CLAGETT, O. THERON, GOOD, C. ALLEN, and McDONALD, JOHN R.: Thymectomy in treatment of myasthenia gravis. Report based on thirty-two cases (ab), April, 617
EBERHARD, THEODORE P. See **SMITH, AUSTIN T.**
EDDY, C. E.: Standardization of apparatus as affecting radiological interpretation (ab), Jan., 150
EDITORIALS
Advisory Editorial Board, May, 754
cancer problem; presidental address, Edgar P. McNamee, 430
contra longiloquia, Richard M. Hewitt, April, 602
Furey, Warren W., president of the Radiological Society of North America, Feb., 270
pulmonary "coin" lesion, Jan., 116
roentgen diagnosis and clinical responsibility, Leo G. Rigler, June, 884
use of radioisotopes in medical practice, R. R. Newell, May, 752
EDLING, NILS P. G.: On the roentgen aspect of prostatic atrophy (ab), Jan., 149
Radiological aspect of the utriculus prostaticus during urethrocystography (ab), June, 918
EDMONDS, DENISE G. See **WRIGHT, H. PAYLING**
EISENBERG, STUART J. See **SAHYOUN, PHILIP F.**
ELCONIN, DAVID V., and STONE, JOSEPH R.: Primary hyperparathyroidism with parathyroid adenoma. Report of a case (ab), April, 626
ELECTROKYMOGRAPHY
—fluorocardiography (electrokymography) (ab), Aldo A. Luisada and Felix G. Fleischner, May, 778
—measurement of heart output by electrokymography (ab), Gordon C. Ring, et al, June, 904
ELECTROTHERAPY
—convulsive fractures of the dorsal spine following electric-shock therapy, Isadore Meschan, Joe B. Scruggs, Jr., and Joseph D. Calhoun, Feb., 180

ELKELES, A.: Radiological studies of the abdominal aorta in individuals over 50 as an aid to the differential diagnosis between benign and malignant ulceration of the stomach (ab), April, 621
ELKIN, DANIEL C. See **COOPER, F. W.**
ELLER, J. J. See **BORAK, J.**
ELLER, W. D. See **BORAK, J.**
ELLINGER, FRIEDRICH, and BARNETT, JAMES C.: Further studies on the influence of dose fractionation on the lethal x-ray effect produced by total body irradiation, Jan., 90
——ROSWIT, BERNARD, and GLASSER, SAMUEL M.: Treatment of radiation sickness with adrenal cortical hormone (desoxycorticosterone acetate) (ab), Feb., 312
ELLIS, FRANK: Treatment of osteoclastoma by radiation (ab), April, 632
ELLISON, EDWIN H.: Diaphragmatic hernia. Review of the literature and report of two unusual cases (ab), Jan., 137
ELTZHOLTZ, D. C. See **CRONKITE, EUGENE P.**
EMBOLISM
—fat embolism (ab), J. E. Dunphy and Frederic W. Ilfeld, May, 788
—pulmonary embolism; analysis of 74 autopsy cases since 1941 (ab), Klaus Dehlinger and Paul Riemenschneider, March, 452
EMBRYOMA. See Kidneys, tumors
EMERGENCIES
—respiratory emergencies in the newborn (ab), Willard F. Goff, Jan., 132
EMPHYSEMA
—acute mediastinal and subcutaneous emphysema (ab), L. Fridjohn and P. G. Azzopardi, April, 618
—Boeck's sarcoid; case complicated by pulmonary emphysema and cor pulmonale (ab), Irving Zimmerman and Norman Mann, June, 900
—pneumomediastinum in the newborn infant (ab), Felix Heald and T. S. Wilder, May, 775
—spontaneous pneumomediastinum in pregnancy (ab), D. J. MacRae, April, 618
EMPYEMA
—pyogenic empyema with extension below the diaphragm (ab) William L. Guyton and Howard W. Jones, Jr., April, 617
ENCEPHALOGRAPHY. See Brain, roentgenography
ENCEPHALOMYELITIS
—roentgen manifestations of acute and healed toxoplasmic encephalomyelitis, Wynton H. Carroll, April, 554
ENCRANTZ, JAN-CARL: Distentional luxation, an early symptom sometimes occurring in various conditions of pain in the hip joint (ab), Feb., 302
ENDARTERITIS. See Thromboendarteritis
ENDOCARDITIS
—Lutembacher's syndrome associated with subacute bacterial endocarditis; case (ab), Edward R. H. Kurz and Isidore Fischer, Jan., 136
ENDOCRINE GLANDS
—endocrinopathies associated with hyperostosis frontalis interna (ab), Floyd E. Harding, Feb., 293
ENDOCRINE THERAPY
—carcinoma of prostate: statistical study and evaluation of endocrine therapy, with a preliminary report of an additional method of treatment (irradiation of adrenals) (ab), Harry Q. Gahagan and J. L. Fischman, Feb., 308
ENDOMETRIOSIS
—roentgen diagnosis of adenomyosis uteri (ab), Morris A. Goldberger, et al, Feb., 305
ENEMATA. See Intestines, roentgenography; Intussusception
ENGLE, EARL T. See **ROBINSON, JOHN N.**
ENGLE, ROBERT B. See **LEVI, LEO M.**
ENGSTRÖM, ARNE: Microradiography (ab), May, 791
——HAMBERGER, C. A., and WELIN, SÖLVE: A röntgen-ray microspectrographic investigation of the inflammatory destruction of the mastoid bone (ab), May, 768
——and WELIN, SÖLVE: A method for the quantitative roentgenological determination of the amount of calcium salts in bone tissue. Its use in the study of calcium reduction in the phalanges of the fingers in chronic polyarthritis (ab), May, 783
ENTERITIS. See Intestines, tuberculosis
EOSINOPHILS. See Bones, tumors; Lungs, pathology; Ribs, tumors
EPILATION. See Ringworm
EPIPHYSES
—dysplasia epiphysialis punctata (ab), H. A. Thomas Fairbank, Jan., 143
—premature epiphysial fusion at knee joint in tuberculous disease of the hip (ab), W. Parke, et al, Jan., 147
EPIPLOPERICOLITIS. See Omentum
EPITHELIOMA. See Skin, cancer
EPSTEIN, BERNARD S.: Angiocardiography: its application to the diagnosis of coarctation of the aorta, Feb., 211
——COHEN, HYMAN L., and NATELSON, SAMUEL: A new series of radiopaque compounds. II. Further notes on the cholecystographic uses of certain iodinated hydroxyphenyl fatty acids, Jan., 87
EPSTEIN, ISAAC: Mediastinal defect with interpleural communication observed during pneumothorax therapy. Report of a case (ab), Jan., 136
Platybasia associated with an unusual case of pulmonary tuberculosis. Report of a case with necropsy (ab), April, 613
ERICKSON, PAUL T., and MAYORAL, A.: An unusual lesion of the talus occurring in leprosy, March, 357
ERICKSON, THEODORE C., LARSON, FRANK, and GORDON, EDGAR S.: Uptake of radioactive phosphorus by malignant brain tumors (ab), May, 800
ERNST, EDWIN C., Jr., and HEILBRUN, NORMAN: Diagnosis of intraspinal hemangiomas by myelography, March, 417
ERNSTENE, A. CARLTON. See **PROUDFIT, WILLIAM L.**
ERYTHROBLASTOSIS, FETAL
—clinical and roentgen manifestations (ab), Max Ritvo, et al, Feb., 304
ERYTHROCYTES
—further studies of the circulation with radioactive erythrocytes (ab) G. Nylin and S. Hedlund, March, 475
ESOPHAGUS
—gastroscopic perforation of esophagus and stomach; 3 cases (ab), Leonard M. Asher and Sidney Cohen, May, 780
—obstruction of the gastro-esophageal junction (ab), P. R. Allison, June, 907
—Plummer-Vinson syndrome (ab), C. Bonorino Udaondo, et al, March, 457
—radiologic study of the paradiaphragmatic esophagus and of the cardia (ab), Albert Jutras, et al, June, 907
—right aortic arch with vascular ring constricting esophagus and trachea; 2 cases (ab), Béla Halpert, et al, April, 619
—use of CO_2 and air as antispasmodics (ab), Paul Cave, March, 457
cancer
—hiatus hernia and carcinoma of stomach and esophagus (ab), Irving B. Brick, June, 908
tumors
—carcinosarcoma; case (ab), Arthur P. Stout, et al, March, 458
—leiomyoma; case (ab), Alfred Hurwitz, Jan., 139
ESSENBERG, J. M.: Response of germ cells to gonadotropic hormones in x-ray injured ovaries of young white mice (ab), Jan., 156
ESSENSON, LAWRENCE, and GINZBURG, LEON: Volvulus of the sigmoid (ab), Jan., 141
ESSER, CLAUS: Bronchial carcinoid (adenoma) (ab), April, 616
ETHMOID SINUS
—mucoceles of the fronto-ethmoidal sinuses. Analysis of roentgen criteria. Relation of frontal bone mucoceles to ethmoidal sinuses, Russell Wigh, April, 579
diETHYL β-IODOETHYL AMINE HYDROCHLORIDE. See Nitrogen Mustards
ETTINGER, ALICE: Small intestinal pattern in sprue and similar deficiency diseases (ab), April, 622
ETTMAN, IRVING K. See **KOIRANSKY, HENRY G.**
EUSTACHIAN TUBE
—irradiation (ab), Edmund P. Fowler, Jr., Jan., 153
EVANS, TITUS C. See **von SALLMANN, LUDWIG**
EWART, FRED E., Jr. See **PIRANI, CONRAD L.**
EWELL, GEORGE H. See **BRUSKEWITZ, HAROLD W.**
EXALTO, J., and WALDECK, K.: Bronchiogenic cyst of the mediastinum (ab), Jan., 135
EXHIBITS
—new viewing boxes, C. E. Hufford, March, 435
EXOPHTHALMOS
See also Goiter, exophthalmic
—pulsating exophthalmos due to defective development of the sphenoid bone (ab), E. Graeme Robertson, June, 897
EXOSTOSES
—hereditary multiple exostoses (ab), Joseph Rose and Paul D. Doolan, April, 624
EXPLOSIONS
—blast injury of the lungs, with report of case occurring in peace time, Martin Schneider and C. P. Klein, April, 548
EXTREMITIES
See also Bones, growth; Varicose Veins
blood supply
—anatomical-spatial relationships of the deep veins of the lower extremity as a basis for venographic interpretation, Davitt A. Felder, April, 521
—measurement of the rate of venous blood-flow in the legs of women at term and in the puerperium, using radioactive sodium (ab), H. Payling Wright, et al, Jan., 138
—method of estimating the time at which a counting rate changes, using a Geiger-Müller counter (ab), S. B. Osborn and H. Payling Wright, Jan., 138
—method of venography, Davitt A. Felder, April, 516
—retrograde arteriography in the diagnosis of cardiovascular lesions: visualization of aneurysms and peripheral arteries (ab), Norman E. Freeman and Earl R. Miller, Jan., 137
EYELIDS
—x-ray therapy of inflammatory lesions (ab), Edward C. Albers and H. M. Buley, May, 797
EYES
—blood groups and effects of roentgen irradiation in retrolental fibroplasia (ab), Thomas O. Paul, June, 926
—differential diagnosis of Boeck's sarcoidosis; 10 cases with ocular involvement (ab), Byron L. Gifford and Arlington C. Krause, June, 900
—roentgen ray treatment; further experiences (ab), Herbert S. Alden, et al, March, 473
—studies of the eye with radiosodium autographs (ab), Ludwig von Sallman, et al, April, 638
—unilateral paralysis of eye muscles associated with intracranial saccular aneurysms (ab), Edwin Boldrey and Earl R. Miller, Jan., 137

F

FABRITIUS, H. F., FROVIG, A. G., and KRISTIANSEN, K.: Percutaneous cerebral angiography and cerebral abscess (ab), March, 445

FACE
—associated facial and intracranial hemangiomas (ab), Daniel F. Downing and Marshall B. Kreidberg, May, 767

FAINSINGER, M. H. See **OOSTHUIZEN, S. F.**

FAIRBANK, H. A. THOMAS: Chondro-osteo-dystrophy. Morquio-Brailsford type (ab), April, 624
Diaphysial aclasis (ab), Jan., 143
Dysplasia epiphysialis punctata (ab), Jan., 143
Gargoylism (ab), April, 625

FALLER, WILLIAM W. See **CUTTER, HAROLD C.**

FALLOPIAN TUBES
roentgenography. See Uterus

FALLOT'S TETRALOGY. See Heart, abnormalities

FALOR, WILLIAM H., and KYRIAKIDES, A. H.: Ectopia bronchi (ab), March, 448

FARKAS, E. See **LOUBEYRE, J.**

FAT
—fat embolism (ab), J. E. Dunphy and Frederic W. Ilfeld, May, 788

FAWCETT, N. W., BOLTON, V. L., and GEEVER, E. F.: Multiple lipomas of the stomach and duodenum (ab), March, 460

FEIGHTNER, FRANK. See **HARTMAN, J. WILEY, Jr.**

FELDER, DAVITT A.: Anatomical-spatial relationships of the deep veins of the lower extremity as a basis for venographic interpretation, April, 521
Method of venography, April, 516

FELL, EGBERT H. See **GASUL, BENJAMIN M.**

FELSON, BENJAMIN: Appendiceal calculi. Incidence and clinical significance (ab), April, 623

——COHEN, SANDER, COURTER, SANFORD R., and McGUIRE, JOHNSON: Anomalous right subclavian artery, March, 340

——See **HAWLEY, CHAPIN**

FEMUR
—osteochondritis dissecans of head of femur (ab), Forrest L. Flashman and Ralph K. Ghormley, May, 786
fractures
—classification and treatment of trochanteric fractures (ab), Harold B. Boyd and Lawrence L. Griffin, May, 786
—etiology of trochanteric fractures (ab), George N. Spears and J. T. Owen, June, 915
pathology
—aseptic necrosis of femoral head following roentgen therapy for carcinoma of the cervix uteri (ab), Stanley D. Simon March, 476
—degenerative osteoarthritis of hip joint: survey of degenerative arthritis secondary to aseptic necrosis of femoral head (ab), Thomas Horwitz, Feb., 303
tumors
—osteoid osteoma; case with probable double lesion (ab), Paul W. Lapidus and Edward P. Salem, Feb., 303

FERNSTRÖM, ULF. See **SJÖQVIST, OLOF**

FETUS
See also Craniometry; Erythroblastosis, Fetal; Monsters
—detection of fetal abnormalities (ab), J. Blair Hartley, May, 789
—fetal renal secretion and its significance in congenital deformities of the ureters and urethra (ab), Sven R. Kjellberg and Ulf Rudhe, Feb., 305
—intra-uterine fractures of the tibia and fibula; case, with correction by osteotomy and plating (ab), George H. Dawson, Jr., March, 464
—tolerance to roentgen rays; case, Arthur A. Hobbs, Jr., Feb., 242

FIBROPLASIA, RETROLENTAL. See Eyes

FIBULA
—intra-uterine fractures of tibia and fibula; case, with correction by osteotomy and plating (ab), George H. Dawson, Jr., March, 464

FIDLER, ALAN. See **MELAMED, ABRAHAM**

FILMS
See also Roentgenograms
—fogging of photographic film by radioactive contaminants in cardboard packaging materials (ab), J. H. Webb, March, 476

FINET, F. See **LEMOINE, J. M.**

FINGERS AND TOES
See also Arachnodactylia
—method for the quantitative roentgenological determination of the amount of calcium salts in bone tissue: its use in the study of calcium reduction in the phalanges of the fingers in chronic polyarthritis (ab), Arne Engström and Sölve Welin, May, 783
syphilis
—osteoperiostitis—skull, ribs, and phalanges; case (ab), John W. Metcalfe, May, 784

FINNEGAN, THEODORE E. See **PILLOW, RANDOLPH P.**

FIRESTONE, GEORGE M., and BENSON, ELLIS S.: Coexisting disseminated coccidioidomycosis and tuberculosis (ab), March, 451

FIRSTATER, MAURICIO. See **GOMEZ, JOSÉ M.**

FISCHER, F. K.: A new method of demonstration of ligamentous changes in lumbago and sciatica (ab), March, 463

FISCHER, ISIDORE. See **KURZ, EDWARD R. H.**

FISCHMAN, J. L. See **GAHAGAN, HARRY Q.**

FISHER, JEROME K. See **SHAFER, JUNE C.**

FISTULA
—carcinoma developing in chronic draining cutaneous sinuses and fistulas (ab), A. K. McAnally and Malcolm B. Dockerty, Jan., 143
—demonstration of sinus tracts, fistulas, and infected cavities by lipiodol (ab), James M. Dell, Jr., Jan., 150
arteriovenous
—of lung (ab), F. D. Beddard, May, 774
renoduodenal
—spontaneous renoduodenal fistulas, J. Dudley King, Jan., 82

FLASHMAN, FORREST L., and GHORMLEY, RALPH K.: Osteochondritis dissecans of the head of the femur (ab), May, 786

FLEISCHNER, FELIX G.: Bronchial peristalsis (ab), June, 897

——and BERNSTEIN, CHARLES: Roentgen-anatomical studies of the normal ileocecal valve, Jan., 43

——See **LUISADA, ALDO A.**

——See **MUELLNER, S. RICHARD**

FLETCHER, C. M., MANN, K. J., DAVIES, I., COCHRANE, A. L., GILSON, J. C., and HUGH-JONES, P.: Classification of radiographic appearances in coalminers' pneumoconiosis (ab), June, 902

FLETCHER, GILBERT H.: Symposium on cancer of the cervix uteri. Roentgen treatment of cancer of the cervix, June, 832

FLIEG, WALTER. See **PRINZMETAL, MYRON**

FLIEGEL, OTTO: Parrot's syphilitic pseudoparalysis (ab), March, 463

FLUHARTY, REX G. See **RAWSON, RULON W.**

FOLIC ACID
—treatment of leukemia and allied disorders with folic acid antagonists; effect of aminopterin on skeletal lesions, Frederic N. Silverman, May, 665

FOOD
—gastro-intestinal food hypersensitivity: roentgen demonstration (ab), Edward J. Tallant, et al, March, 459

FOOT
See also Ankle; Calcaneum; Sesamoid Bone; Talus
—congenital sarcoma (ab), M. L. Dreyfuss, April, 631

FOREARM
See also Radius; Ulna
—cancer, gumma and tuberculosis (ab), Nelson C. Jefferson, Jan., 146

FOREIGN BODIES
See also Heart
—bronchography in cases of foreign body (ab), Eelco Huizinga, March, 448

FORSGREN, A. L., NESSET, W. D., and ANDERSON, D. M.: Pheochromocytoma of the adrenal with successful removal. Report of a case (ab), Jan., 149

FOSSATI, FRANCO: Cranial findings in Sjögren's syndrome (ab), May, 768

FOWLER, EDMUND P., Jr.: Eustachian tube irradiation (ab), Jan., 153

FRACTURES
See also under names of bones
—osseous lesions through overload on the normal skeleton; experimental results (ab), E. Rutishauser and G. Majno, March, 462

FRAGILITAS OSSIUM. See Bones

FRANCE, N. E. See **WOLFE, H. R. I.**

FRANK, RALPH C. See **POHLE, ERNST A.**

FRANKEL, CHARLES J. See **COOPER, GEORGE, Jr.**

FRANKLIN, WILLIAM. See **WEINSTEIN, LOUIS**

FRANZ, BRUCE. See **HICKEN, N. FREDERICK**

FRAZER, A. C., FRENCH, J. M., and THOMPSON, M. D.: Radiographic studies showing the induction of a segmentation pattern in the small intestine in normal human subjects (ab), Feb., 299

FREEDE, CHARLES L. See **HALPERT, BÉLA**

FREEMAN, NORMAN E., and MILLER, EARL R.: Retrograde arteriography in the diagnosis of cardiovascular lesions. I. Visualization of aneurysms and peripheral arteries (ab), Jan., 137

FRENCH, J. M. See **FRAZER, A. C.**

FRENCH, LYLE A., and BLAKE, PAUL S.: Cerebral angiography (ab), June, 895

FRÈRE, J. MARSH: Silicosis, March, 450

FRICKE, ROBERT E. See **BOWING, HARRY H.**

FRIDJOHN, L., and AZZOPARDI, P. G.: Acute mediastinal and subcutaneous emphysema (ab), April, 618

FRIEDELL, MORRIS T., SCHAFFNER, FENTON, PICKETT, WILLIAM J., and HUMMON, IRVIN F., Jr.: Radioactive isotopes in the study of peripheral vascular disease. I. Derivation of a circulatory index (ab), May, 799

——See **SCHAFFNER, FENTON**

FRIEDMAN, BARRY. See **PONSETI, IGNACIO V.**

FRIEDMAN, JACK, and RIGLER, LEO G.: A method of double-contrast roentgen examination of the small intestine, March, 365

FRIEDMAN, LOUIS J., LOBSENZ, HERBERT, and JAUERNIG, RUSSELL: Pyelography by rapid injection. Description of an improved method and results in 200 cases (ab), June, 917

FRIEDMAN, ORRIE M. See **SELIGMAN, ARNOLD M.**

FRIMANN-DAHL, J.: Roentgen examination in acute thrombosis, March, 408

FRIST, T. F. See **NEWBOLD, H. L.**

FRITZ, JAMES M., NEWMAN, MELVIN M., JAMPOLIS, ROBERT W., and ADAMS, W. E.: Fate of cardiac foreign bodies (ab), May, 777

FRØVIG, A. G. See **FABRITIUS, H. F.**

FRONTAL BONE
See also Frontal Sinus
—cranial findings in Sjögren's syndrome (ab), Franco Fossati, May, 768
—endocrinopathies associated with hyperostosis frontalis interna (ab), Floyd E. Harding, Feb., 293
FRONTAL SINUS
—mucoceles of the fronto-ethmoidal sinuses. Analysis of roentgen criteria. Relation of frontal bone mucoceles to ethmoidal sinuses, Russell Wigh, April, 579
—rare diseases: their diagnosis and differential diagnosis by roentgenograms (ab), L. Psenner, March, 446
FRYER, MINOT P. See **BROWN, JAMES B.**
FULTON, J. S.: Radiotherapeutic treatment of leukaemia (ab), June, 924

G

GAHAGAN, HARRY Q., and FISCHMAN, J. L.: Carcinoma of the prostate: a statistical study and evaluation of endocrine therapy, with a preliminary report of an additional method of treatment (ab). Feb., 308
GALARZA, MAX ESPINOZA: Tomography of larynx in disseminated pulmonary tuberculosis (ab), June, 897
GALE, J. W. See **CURRERI, A. R.**
GALEN'S VEIN. See Aneurysm, cerebral
GALIHER, CLAUDIA B., and WRIGHT, JEANNE E.: What does a roentgenographic survey teach the public? Including a comparison with other tuberculosis information polls (ab), April, 615
GALLBLADDER
—cholecystitis emphysematosa (ab), Edward E. Jemerin, Jan., 142
—congenital absence (ab), Woodrow Nelson, et al, May, 783
—double gallbladders; 4 cases, one with suppurative cholangitis and bacteremia (ab), N. Frederick Hicken, et al, Feb., 300
—new elastic fibers formed in the wall of the gallbladder: pathologic, clinical and roentgenologic data concerning a hitherto neglected lesion (ab), J. L. Riopelle, June, 909
calculi
—intestinal obstruction caused by gallstone (ab), Charles W. Mayo and Philip W. Brown, May, 782
—stratification of bile in gallbladder and cholelithiasis (ab), B. A. Campbell and A. C. Burton, May, 783
roentgenography
—iodobil as contrast medium (ab), W. Weyland and C. Maier, Jan., 142
—new series of radiopaque compounds. II. Further notes on the cholecystographic uses of certain iodinated hydroxyphenyl fatty acids, Bernard S. Epstein, Hyman L. Cohen, and Samuel Natelson, Jan., 87
GALVIN, GERALD A.: Symposium on cancer of the cervix uteri. Classification of cervical cancer, June, 815
Symposium on cancer of the cervix uteri. Diagnosis of cancer of the cervix: the early lesion, June, 804
GANGLIONEUROMA. See Tumors, ganglioneuroma
GARGOYLISM. See Lipochondrodystrophy
GASS, HARVEY. See **DAVIDOFF, LEO M.**
GASTRECTOMY. See Peptic Ulcer
GASTRITIS. See Stomach
GASTRO-INTESTINAL TRACT
See also Barium; Colon; Intestines; Stomach; etc.
—effect of tetraethylammonium chloride on human gastrointestinal tract (ab), Rosalie B. Neligh, et al, Jan., 139
—gastro-intestinal food hypersensitivity: roentgen demonstration (ab), Edward J. Tallant, et al, March, 459
—mass survey of gastro-intestinal tract to detect cancer of stomach (ab), Sherwood Moore, March, 458
tumors
—lymphosarcoma; 21 cases (ab), M. A. Spellberg and Simon Zivin, Feb., 298
GASTROSCOPY. See Stomach
GASUL, BENJAMIN M., FELL, EGBERT H., MARINO, JOHN J., and DAVIS, CARL B., Jr.: Tricuspid atresia. Report of two cases of young infants, with successful operation (ab), June, 906
GAUCHER'S DISEASE. See Anemia, splenic
GAZIN, ALBERT I., BROOKE, WALLACE S., LERNER, HENRY H., and PRICE, PHILIP B.: Pneumatosis intestinalis. Roentgen diagnosis and surgical management (ab), April, 622
GEEVER, E. F. See **FAWCETT, N. W.**
GEIGER-MÜLLER COUNTER. See Radioactivity
GESCHICKTER, CHARLES F. See **COPELAND, MURRAY M.**
GHORMLEY, RALPH K. See **FLASHMAN, FORREST L.**
GIANT-CELL TUMORS. See Tumors, giant-cell
GIANT CELLS. See Thyroid
GIANTURCO, C.: Fast radiological visceral survey, Jan., 59
GIBBEL, MELVIN I., CROSS, JAMES H., and ARIEL, IRVING M.: Cancer of the tongue. Review of 330 cases (ab), April, 629
GIBSON, H. M.: Ureteral reflux in the normal child (ab), June, 918
GIBSON, STANLEY. See **DAMMANN, J. F., Jr.**
GIFFORD, BYRON L., and KRAUSE, ARLINGTON C.: Differential diagnosis of Boeck's sarcoidosis. Report of ten cases with ocular involvement (ab), June, 900
GILLESPIE, H. W.: Significance of congenital lumbo-sacral abnormalities (ab), April, 627
GILMOUR, MARY D., TOD, MARGARET C., CHARLES, A. H., MARTINDALE, L., and McLAREN, H. C.: Discussion on the artificial menopause, indications, technique and complications (ab), May, 796
——**GLÜCKSMANN, A., and SPEAR, F. G.:** Influence of tumour histology, duration of symptoms and age of patient on radiocurability of cervix tumours (ab), Jan., 152
GILSON, J. C. See **FLETCHER, C. M.**
GILSON, PAUL R. See **STEVENS, CHARLES D.**
GINES, ANGEL R., GOULD, EDUARDO, and CORONEL VERA, J. A.: An appraisal of the results of a six-year tuberculin and mass x-ray survey of population of Asunción: based on more than 100,000 tests (ab), Jan., 133
GINZBURG, LEON. See **ESSENSON, LAWRENCE**
GIVRÉ, ALFREDO. See **OLIVECRONA, HERBERT**
GLADSTONE, HERMAN. See **SUTRO, CHARLES J.**
GLAHN, MOGENS. See **KAAE, SIGVARD**
GLASER, KURT: Double contour, cupping and spurring in roentgenograms of long bones in infants (ab), March, 463
GLASSER, SAMUEL M. See **ELLINGER, FRIEDRICH**
GLIOMA. See Retina, tumors
GLOTZER, SOL: Fluid in the lesser omental sac as a cause of extragastric pressure defect (ab), June, 908
GLÜCKSMANN, A. See **GILMOUR, MARY D.**
GOFF, WILLARD F.: Respiratory emergencies in the newborn (ab), Jan., 132
GOFMAN, JOHN W.: Studies with colloids containing radioisotopes of yttrium, zirconium, columbium, and lathanum. I. The chemical principles and methods involved in preparations of colloids of yttrium, zirconium, columbium, and lathanum (ab), Feb., 311
——See **DOBSON, ERNEST L.**
GOITER
exophthalmic
—thyrotrophic exophthalmos (ab), C. J. B. Muller, March, 473
—use of radioactive iodine in the treatment of Graves' disease (ab), Myron Prinzmetal, et al, March, 475
intrathoracic
—located in posterior mediastinum (ab), Richard H. Sweet, June, 903
GOLDBERGER, EMANUEL. See **LEINER, GEORGE C.**
GOLDBERGER, MORRIS A., MARSHAK, RICHARD H., and HERMEL, MORTIMER: Roentgen diagnosis of adenomyosis uteri (ab), Feb., 305
GOLDFEDER, ANNA: Further studies on the relation between radiation effects, cell viability, and induced resistance to malignant growth. VI. Anomalous radiosensitivities of analogous mouse mammary adenocarcinomas, Jan., 93
GOLDMAN, I. RALPH: Congenital malformation of vertebrae (hemivertebrae) with aplasia of corresponding ribs, associated with a lateral meningomyelocele. Report of a case (ab), Jan., 144
GOMEZ, JOSÉ M., and FIRSTATER, MAURICIO: Primary carcinoma of the male urethra (ab), March, 470
GONADOTROPINS
—response of germ cells to gonadotropic hormones in x-ray injured ovaries of young white mice (ab), J. M. Essenberg, Jan., 156
GOOD, C. ALLEN. See **EATON, L. M.**
——See **JOHNSON, CLIVE R.**
——See **VAN HERIK, MARTIN**
GOODFRIEND, JAMES. See **CARSON, MERL J.**
GOODWIN, J. F., STEINER, R., and WAYNE, E. J.: Transposition of the aorta and pulmonary artery demonstrated by angiocardiography (ab), June, 906
GOOTNICK, ABRAHAM: Dysphagia and mitral valve deformity (ab), Feb., 298
GORBMAN, AUBREY: Tumorous growths in the pituitary and trachea following radiotoxic dosages of I^{131} (ab), May, 801
GORDON, BURGESS, MOTLEY, HURLEY, L., THEODOS, PETER, A., and LANG, LEONARD P.: Anthracosilicosis and its symptomatic treatment (ab), May, 772
GORDON, EDGAR S. See **ERICKSON, THEODORE C.**
GOSSET. See **PRUVOST, P.**
GOTTLIEB, CHARLES, CHU, FLORENCE, and SHARLIN, HERBERT S.: Perforation of a gastric ulcer associated with intracranial hemorrhage in a newborn infant. April, 595
GOUGH, J., JAMES, W. R. L., and WENTWORTH, J. E.: A comparison of the radiological and pathological changes in coalworkers' pneumoconiosis (ab), June, 902
GOULD, EDUARDO. See **GINES, ANGEL R.**
GOULD, WILBUR J. See **WOOLF, VICTOR, F.**
GRAIN, R. See **LEPENNETIER, F.**
GRANGER, W. H. See **WILSON, FRANCIS W.**
GRANT, AUSTIN R., HOUSE, REGINALD K., and CRANDELL, WALTER B.: Eosinophilic granuloma of rib. Report of a case observed for eight years (ab), March, 466
GRANT, OWSLEY. See **LICH, ROBERT, Jr.**
GRANULOMA. See Beryllium; Bones, tumors; Lipogranulomatosis; Ribs, tumors
GRAVES' DISEASE. See Goiter, exophthalmic
GRAY, CHARLES M., NIX, H. G., and WALLACE, A. J.: Thoracopagus twins: prenatal diagnosis, March, 398
GRAYSON, CHARLES E., and KENNEDY, BAYLES R.: Roentgen diagnosis of ruptured aneurysm of the abdominal aorta, March, 413
GRAYZEL, DAVID. See **RABINOVITCH, JACOB**
GREEN, ANTHONY: Rotational roentgen therapy in the horizontal plane. Part I. General considerations and clinical aspect (ab), April, 633

GREENFIELD, MAURICE M., and WALLACE, K. M.: Pigmented villonodular synovitis. March, 350
GREENSPAN, EZRA M.: Hyperchloremic acidosis and nephrocalcinosis. The syndrome of pure "lower nephron" insufficiency (ab), Feb., 305
GREENWOOD, F., and PHILLIPS, W. L.: Bronchial carcinoma: an unusual radiological finding (ab), March, 452
GREENWOOD, JAMES, Jr.: Paraphysial cysts of the third ventricle, with report of eight cases (ab), Feb., 294
GREINER, D. JAMES. See **COPELAND, MURRAY M.**
GRIER, ROBERT S. See **AUB, JOSEPH C.**
GRIFFIN, LAWRENCE L. See **BOYD, HAROLD B.**
GRIFFITH, GEORGE C. See **COSBY, RICHARD S.**
GRIFFITHS, I. H., and THACKRAY, A. C.: Parenchymal carcinoma of the kidney (ab), June, 917
GRISHMAN, ARTHUR. See **MASTER, ARTHUR M.**
GROHOWSKI, A. L. See **KARR, JOHN W.**
GROSS, HARRY, and JEZER, ABRAHAM: Hypertension without significant cardiac enlargement. A clinicopathologic study (ab), April, 619
GROSS, S. W. See **WECHSLER, I. S.**
GUINET, P. See **DARGENT, M.**
GUMMA. See Syphilis
GURDJIAN, E. S., WEBSTER, J. E., and LISSNER, H. R.: The mechanism of skull fracture, March, 313
GUTTMANN, RUTH J.: X-ray therapy of primary inoperable carcinoma of the breast, April, 567
GUYTON, WILLIAM L., and JONES, HOWARD W., Jr.: Pyogenic empyema with extension below the diaphragm (ab), April, 617

H

HADLEY, LEE A.: Constriction of the intervertebral foramen. A cause of nerve root pressure (ab), June, 912
HAINES, SAMUEL F. See **KELSEY, MAVIS P.**
HALLAM, KEITH H.: Limitations of the role of the radiologist in diagnosis of pulmonary tuberculosis (ab), Jan., 132
Pulmonary tuberculosis in the elderly (ab), Jan., 133
HALLIDAY, JOHN: A rare case of bone dystrophy (ab), June, 911
HALPERT, BÉLA, SNODDY, WILLIAM T., BOHAN, KENNETH E., and FREEDE, CHARLES L.: Right aortic arch with a vascular ring constricting esophagus and trachea. Report of two cases (ab), April, 619
HAMARTOMA. See Tumors, hamartoma
HAMBERGER, C. A. See **ENGSTRÖM, ARNE**
HAMILTON, JOSEPH G.: The metabolism of the radioactive elements created by nuclear fission (ab), May, 801
——See **SCOTT, KENNETH G.**
HAMM, FRANK C. See **LAVALLE, LAWRENCE L.**
HANDS. See Fingers and Toes; Sesamoid Bone
HANLON, C. ROLLINS. See **COOLEY, ROBERT N.**
HANSON, A. O. See **QUASTLER, H.**
HARDING, FLOYD E.: Endocrinopathies associated with hyperostosis frontalis interna (ab), Feb., 293
HARDISTY, NORRIS M. See **DOTTER, CHARLES T.**
HARDY, JANET B. See **RAVITCH, MARK M.**
HARE, HUGH F., and NEWCOMB, RICHARD V.: Carcinoma of thyroid in children: ten-year follow-up, March, 401
——**and SORNBERGER, C. FRANKLIN:** Carcinoma of the cervix (ab), April, 629
——See **SWINTON, NEIL W.**
HARPER, FRED R., CONDON, WILLIAM B., and WIERMAN, WILLIAM H.: Suppurative disease of the lungs (ab), May, 770
HARRISON, C. V., and WOOD, PAUL: Hypertensive and ischæmic heart disease: a comparative clinical and pathological study (ab), June, 906
HART, VERNON L.: Congenital dislocation of the hip. Early recognition and treatment during the first six months of life (ab), June, 914
Congenital dysplasia of the hip joint. Relationship between congenital subluxation and congenital dislocation (ab), March, 464
HARTLEY, J. BLAIR: Detection of foetal abnormalities (ab), May, 789
HARTMAN, J. WILEY, Jr., FEIGHTNER, FRANK, and TITUS, PAUL: Quadruplet pregnancy: diagnosis at seventeen weeks of gestation (ab), April, 628
HARTMAN, SEYMOUR A. See **MASSON, JOHN M.**
HARVEY, ROLFE M.: Wilms' tumor: evaluation of treatment methods, May, 689
HATCH, FLOYD F. See **NELSON, WOODROW**
HAWLEY, CHAPIN, MEYER, PAUL D., and FELSON, BENJAMIN: Roentgenologic diagnosis of prolapsed gastric mucosa (ab), May, 780
——**and MITHOEFER, JAMES:** Ileal prolapse, March, 380
HEAD, JEROME R., and MOEN, CHESTER W.: Late nontuberculous complications of calcified hilus lymph nodes (ab), June, 900
——See **ARIEL, IRVING M.**
HEADACHE
—convolutional markings in the skull roentgenograms of patients with headache (ab), Leo M. Davidoff and Harvey Gass, Feb., 293
HEALD, FELIX, and WILDER, T. S.: Pneumomediastinum in the newborn infant (ab), May, 775
HEART
See also Cardiovascular System
—acquired dextrocardia; unusual case (ab), George C. Leiner and Emanuel Goldberger, April, 618
—biologic decay periods of sodium in normal man, in patients with congestive heart failure, and in patients with the nephrotic syndrome as determined by Na^{22} as the tracer (ab), Sam Threefoot, et al, Jan., 154
—fibrosis of pancreas in infants and children: an illustrated review of certain clinical features with special emphasis on pulmonary and cardiac aspects (ab), Charles D. May and Charles U. Lowe, May, 776
—fluorocardiography (electrokymography) (ab), Aldo A. Luisada and Felix G. Fleischner, May, 778
—hypertension without significant cardiac enlargement: a clinicopathologic study (ab), Harry Gross and Abraham Jezer, April, 619
—hypertensive and ischemic disease; comparative clinical and pathological study (ab), C. V. Harrison and Paul Wood, June, 906
—in hypertension (ab), Edwin P. Maynard, Jr., April, 618
—measurement of heart output by electrokymography (ab), Gordon C. Ring, et al, June, 904
—pericardial effusion: a constant, early and major factor in the cardiac syndrome of hypothyroidism (myxedema heart) (ab), Richard A. Kern, et al, May, 777
—radiocardiography and its clinical applications (ab), Myron Prinzmetal, et al, May, 778
abnormalities
—angiocardiography in congenital heart disease of cyanotic type. II. Observations on tricuspid stenosis or atresia with hypoplasia of the right ventricle, Robert N. Cooley, Robert D. Sloan, C. Rollins Hanlon, and Henry T. Bahnson, June, 848
—anomalous right vein entering the inferior vena cava; 2 cases diagnosed during life by angiocardiography and cardiac catheterization (ab), Charles T. Dotter, et al, June, 906
—diagnosis and therapy of congenital disease (ab), A. Lichtenstein, June, 905
—interatrial septal defect (ab), Richard S. Cosby and George C. Griffith, June, 905
—Lutembacher's syndrome associated with subacute bacterial endocarditis; case (ab), Edward R. H. Kurz and Isidore Fischer, Jan., 136
—morbus caeruleus: 50 cases after the Blalock-Taussig operation (ab), Charles Baker, et al, March, 455
—observations on 117 patients operated on for congenital pulmonary stenosis (ab), J. F. Dammann, Jr., et al, April, 619
—tetralogy of Fallot: surgical treatment (ab), A. Rodriguez Diaz and H. Anido, May, 778
—tricuspid atresia; 2 cases of young infants, with successful operation (ab), Benjamin M. Gasul, et al, June, 906
foreign bodies
—fate (ab), James M. Fritz, et al, May, 777
hypertrophy
—Boeck's sarcoid: case complicated by pulmonary emphysema and cor pulmonale (ab), Irving Zimmerman and Norman Mann, June, 900
—lipoid granulomatosis (xanthomatosis) with marked pulmonary fibrosis and cor pulmonale as outstanding manifestations (ab), Samuel J. Schneierson and Louis Schneider, March, 450
infarction
—aneurysm of left ventricle secondary to myocardial infarction; case in 35-year-old man (ab), H. L. Newbold, et al, March, 454
—massive calcification in infarcted myocardium, Henry P. Brean, Joseph H. Marks, Merrill C. Sosman, and Monroe J. Schlesinger, Jan., 33
—myocardial infarction and cardiac aneurysm: their roentgen diagnosis (ab), Eric Samuel, March, 454
roentgenography
—mass miniature radiography in detection of disease (ab), Alex Maclean and Alfred Rogen, June, 903
—new method of radiologic exploration of the heart and lungs, and its use in mediastinal tumors (ab), Maurice Marchal, May, 775
—radiology of rheumatic heart disease (ab), John Parkinson, April, 618
—Starling's law and x-ray density changes of heart shadow (ab), Gordon C. Ring, et al, Feb., 297
size. See also Heart, hypertrophy
—condition of the cardiac volume during pregnancy (ab), Sven R. Kjellberg, et al, Jan., 136
—relation of cardiac volume to the weight and surface area of the body, the blood volume and the physical capacity for work (ab), Sven R. Kjellberg, et al, Jan., 137
valves. See Mitral Valve
HEDLUND, S. See **NYLIN, G.**
HEIDENHÖFFER, J.: Etiology, roentgenology and therapy of transformation zones (ab), April, 628
HEILBRUN, NORMAN. See **ERNST, EDWIN C., Jr.**
HELSEL, E. V. See **CASHMAN, B. Z.**
HEMANGIOMA. See Tumors, angioma
HEMATOMA. See Brain; Meninges
HEMOPNEUMOTHORAX
—sterile hemopneumothorax caused by softening and perforation of pulmonary infarct (ab), John M. Masson and Seymour A. Hartman, June, 903
HEMORRHAGE. See Cranium; Meninges
HEMOSIDEROSIS
See also Siderosis
—acute idiopathic pulmonary hemosiderosis (ab), Leslie Nancekievill, Feb., 296

HEMOSIDEROSIS—*cont.*
—of lung due to mitral disease; 6 cases simulating pneumoconiosis (ab), Eugene P. Pendergrass, et al, March 449
HENNY, GEORGE C.: Roentgenographic estimation of the mineral content of bone, Feb., 202
HENRIKSEN, ERLE: Symposium on cancer of the cervix uteri. Dispersion of cancer of the cervix, June, 812
Symposium on cancer of the cervix uteri. Surgical treatment of cancer of the cervix, June, 819
HERMEL, MORTIMER. See **GOLDBERGER, MORRIS A.**
HERNDON, CHARLES H. See **HEYMAN, CLARENCE H.**
HERNIA
See also Lungs
—simple experimental method of evaluation for the Bassini and allied types of herniorrhaphy (ab), F. S. A. Doran and W. H. Lonsdale, March, 457
diaphragmatic
—differential diagnosis of hiatus hernia and coronary artery disease (ab), Arthur M. Master, et al, March, 456
—hiatus hernia (ab), G. G. Richards and K. A. Crockett, March, 456
—hiatus hernia and carcinoma of stomach and esophagus (ab), Irving B. Brick, June, 908
—incidence of hiatus hernia and associated lesions diagnosed by roentgen ray (ab), Irving B. Brick, March, 456
—review of literature and report of 2 unusual cases (ab), Edwin H. Ellison, Jan., 137
—right-sided hernia (ab), G. A. P. Hurley, May, 779
—simultaneous association of situs inversus, coronary heart disease, and hiatus hernia; report of case and review of literature (ab), Henry N. Rosenberg and I. N. Rosenberg, March, 456
epigastric
—coexistence of intra-abdominal lesions in patients with epigastric hernia (ab), John M. Hoffman and Gregg D. Wood, March, 457
internal
—right paraduodenal hernia; case (ab), James R. Thomason and William H. Moretz, May, 780
paraduodenal. See Hernia, internal
HERPES ZOSTER
—occurrence in carcinoma of breast (ab), Eugene P. Pendergrass and David Kirsh, May, 794
HERSPERGER, W. GRAFTON: Diagnosis of chronic recurrent pancreatitis (ab), March, 461
HEYMAN, CLARENCE H., and HERNDON, CHARLES H.: Congenital posterior angulation of the tibia (ab), June, 915
HEYMAN, J., and BELONOSCHKIN, B.: Surgical intervention in recurrent and in "radioresistant" cancer of the uterine cervix (ab), June, 922
HICKEL, RICHARD, and CORNET, PAUL: Radiological signs of polycystic disease of the kidneys (ab), March, 469
HICKEN, N. FREDERICK, CORAY, Q. B., and FRANZ, BRUCE: Anatomic variations of the extrahepatic biliary system as seen by cholangiographic studies (ab), April, 623
——**STEVENSON, VERNON L., ALLEN, LOWRY M., and CORNWALL, CHARLES R.:** Double gall bladder. Report of four cases, one with suppurative cholangitis and bacteremia (ab), Feb., 300
HIDRADENITIS
—hidradenitis suppurativa axillaris: an analysis of 54 cases treated with roentgen rays, Samuel G. Schenck, Jan., 74
—hidrosadenitis axillaris and its roentgen treatment (optimum total dose and intenseness) (ab), N. Laughe-Hansen and Svend Lyndrup, Jan., 153
HILL, HAROLD A. See **MOTTRAM, M. E.**
HILL, R. M.: Non-specific (eosinophilic) granuloma of bone (ab), June, 911
HIMADI, GEORGE M. See **WOOD, ERNEST H., Jr.**
HINSHAW, H. CORWIN. See **HODGSON, CORRIN H.**
——See **OLSEN, ARTHUR M.**
——See **RIGGINS, H. McLEOD**
HINTON, J. WILLIAM. See **CHASSIN, JAMESON L.**
HIP
—degenerative osteoarthritis: survey of degenerative arthritis secondary to aseptic necrosis of femoral head (ab), Thomas Horwitz, Feb., 303
—distentional luxation, an early symptom sometimes occurring in various conditions of pain in the hip joint (ab), Jan-Carl Encrantz, Feb., 302
—dysplasia: a factor in the development of static osteoarthropathy (ab), Joseph Levitin, May, 786
—osteoarthritis (ab), Alex Robinson, Feb. 302
dislocations
—congenital dislocation: early recognition and treatment during the first six months of life (ab), Vernon L. Hart, June, 914
—congenital dysplasia: relationship between congenital subluxation and congenital dislocation (ab), Vernon L. Hart, March, 464
tuberculosis
—of bones of hip joint (ab), Charles J. Sutro and Herman Gladstone, March, 466
—premature epiphysial fusion at knee joint in tuberculous disease of hip (ab), W. Parke, et al, Jan., 147
HISTOPLASMOSIS
—correlated study of tuberculin, histoplasmin and coccidioidin sensitivities with pulmonary calcifications in the Rocky Mountain area (ab), W. K. Absher and F. Cline, Jr., May, 771
—pulmonary infiltration associated with sensitivity to histoplasmin; case (ab), Daniel W. Zahn, May, 771
HITCHCOCK, CLAUDE R. See **KREMEN, ARNOLD J.**
HOBBS, ARTHUR A., Jr.: Fetal tolerance to roentgen rays. Case report, Feb., 242
HODGE, G. B. See **SCHANHER, PAUL W., Jr.**
HODGES, FRED J.: Downward displacement of the gastric cardia, Feb., 194
HODGES, PAUL C., JENKINS, R. TABER, and WILLIAMS, S. F.: An improved x-ray photctimer, Jan., 64
HODGKIN'S DISEASE
—histopathologic and clinical classification with radiotherapeutic response (ab), Philip F. Sahyoun and Stuart J. Eisenberg, Feb., 308
—observations on bone lesions (ab), P. J. Moir and J. G. Brockis, March, 463
—of lung: roentgen appearance and therapeutic management, Archie Sheinmel, Bernard Roswit, and Lewis R. Lawrence, Feb., 165
—pregnancy and Hodgkin's disease, with report of 3 cases (ab), S. Chas. Kasdon, Jan., 153
—role of nitrogen mustard (HN2) as a systemic adjunct to radiation therapy of certain malignant diseases (ab), Bernard Roswit and Gustave Kaplan, April, 633
HODGSON, CORRIN H., and HINSHAW, H. CORWIN: The general practitioner and the clinical investigation of some chronic pulmonary diseases (ab), June, 898
HODGSON, JOHN R.: The normal roentgenogram of the chest in infants and children (ab), April, 614
HOFFMAN, GEORGE L. Jr.: Current trends in diagnosis and treatment of cervical cancer (ab), May, 795
HOFFMAN, I. LOUIS, and HUARD, GEORGE S.: Report of case of Loeffler's syndrome with a concomitant non-specific maculo-papular rash (ab), June, 903
HOFFMAN, JOHN M., and WOOD, GREGG D.: Coexistence of intra-abdominal lesions in patients with epigastric hernia (ab), March, 457
HOLDEN, H.: Solitary plasmocytoma of bone (ab), Feb., 303
HOLDEN, LAWRENCE B. See **SUGAR, OSCAR**
HOLT, JOHN F. See **BASSETT, ROBERT C.**
——See **NELIGH, ROSALIE B.**
HOOBLER, SIBLEY W. See **NELIGH, ROSALIE B.**
HOPF, MAX: Polyostotic fibrous dysplasia (Jaffe-Lichtenstein) (ab), April, 624
HORMONES. See Adrenal Preparations; Gonadotropins
HORTON, SAMUEL H., Jr.: Creeping eruption. Report of case with Loeffler's syndrome (ab), June, 903
HORWITZ, THOMAS: Degenerative osteoarthritis of the hip joint: survey of degenerative arthritis secondary to aseptic necrosis of the femoral head (ab), Feb., 303
HOSPITALS
—routine fluororoentgen chest examinations of hospital admissions from the viewpoint of the radiologist (ab), Abraham Melamed and Alan Fidler, Feb., 295
HOTCHKISS, ROBERT S., SCHOENAU, CARL W., and ACCETTOLA, ALBERT B.: Osteitis pubis (ab), Jan., 145
HOUSE, REGINALD K. See **GRANT, AUSTIN R.**
HUARD, GEORGE S. See **HOFFMAN, I. LOUIS**
HUBAY, CHARLES A.: Sesamoid bones of the hands and feet (ab), March, 467
HUEBNER, ROBERT J., JELLISON, WILLIAM L., and BECK, M. DOROTHY: Q fever—a review of current knowledge (ab), Feb., 296
HUGH-JONES, P. See **FLETCHER, C. M.**
HUGHES, BRODIE: Cerebral tumours (ab), June, 896
HUGHES, J. P. W. See **STEWART, ALICE**
HUIZINGA, EELCO: Bronchography in cases of foreign body (ab), March, 448
Photographs at different points of time and in inspiration and expiration (ab), March, 447
HULTBERG, SVEN: Short-distance low-voltage roentgen therapy of inflammatory conditions in the tonsils (ab), June, 924
Three cases of irradiation injuries (ab), June, 926
HUMERUS
—evolution of metaphyseal fibrous defects (ab), Ignacio V. Ponseti and Barry Friedman, June, 914
—intrathoracic dislocation (ab), Esmond F. West, Jan., 146
HUMMON, IRVIN F., Jr. See **FRIEDELL, MORRIS T.**
——See **SCHAFFNER, FENTON**
HUMPHREY, ARTHUR A., and OLMSTEAD, EDWIN G.: Lipoid pneumonia in neuropsychiatric and debilitated patients (ab), March, 449
HUMPHREYS, GEORGE H., II. See **STOUT, ARTHUR P.**
HUNTER, F. T., MERRILL, O. E., TRUMP, J. G., and ROBBINS, L. L.: Protection of personnel engaged in roentgenology and radiology (ab), June, 925
HUNTER, SAMUEL W. See **KREMEN, ARNOLD J.**
HURLEY, G. A. P.: Right-sided diaphragmatic hernia (ab), May, 779
HURWICH, JEROME J.: Lung hernia. Case report and review of literature (ab), March, 449
HURWITZ, ALFRED: Leiomyoma of the esophagus: report of a case (ab), Jan., 139
HYALURONIDASES
—hyaluronidases as a factor hastening the spread and absorption of water-soluble radiopaque substances deposited intracutaneously, subcutaneously, or intramuscularly (ab), Olle Olsson and Olov Lofgren, Feb., 305
HYDE, BERNARD, and HYDE, LEROY: Tuberculous spontaneous pneumothorax (ab), May, 773
HYDE, LEROY. See **HYDE, BERNARD**

HYDROCEPHALUS
—amyotonia congenita associated with occlusion of the sagittal sinus and bilateral subdural hygroma; demonstration of occlusion by diotrast sinography; case (ab), Michael Scott, Jan., 130
—distention of the subarachnoid space with cerebrospinal fluid in infants; enlargement of the head and spasticity; surgical correction (ab), Charles Bagley, Jr., et al, April, 613
HYDRONEPHROSIS
—late renal changes in paraplegia: hydronephrosis due to vesico-ureteral reflux (ab), Herbert S. Talbot and R. Carl Bunts, April, 629
HYGROMA. See Hydrocephalus
HYMAN, MILTON D. See **POTAMPA, PHILLIP B.**
HYPERHIDROSIS
—roentgen therapy; observations of 122 patients (ab), J. Borak, et al, May, 797
HYPEROSTOSES, INFANTILE CORTICAL. See Bones
HYPEROSTOSIS FRONTALIS INTERNA. See Frontal Bone
HYPOPHARYNX. See Pharynx
HYSTEROSALPINGOGRAPHY. See Uterus

I

ILEOCEAL VALVE
—roentgen-anatomical studies of normal ileocecal valve, Felix G. Fleischner and Charles Bernstein, Jan., 43
ILEOSTOMY. See Intestines
ILEUM. See Colitis; Intestines
ILEUS. See Intestines
ILFELD, FREDERIC W. See **DUNPHY, J. E.**
IMMUNITY
—the lymphocyte: studies on its relationship to immunologic processes in the cat (ab), Charles G. Craddock, Jr., et al, Jan., 156
INCONTINENCE. See Urination
INDUSTRY AND OCCUPATIONS
—intervertebral disk injury: analysis of 113 industrial cases (ab), Henry C. Marble and William A. Bishop, Jan., 144
diseases and poisoning. See also Pneumoconiosis; Siderosis
—acute dermatitis and pneumonitis in beryllium workers; review of 406 cases in 8-year period with follow-up on recoveries (ab), Joseph M. DeNardi, et al, May, 772
—acute pneumonitis in a beryllium worker (ab), G. Riddell Royston, May, 772
—acute pneumonitis in workers exposed to beryllium oxide and beryllium metal (ab), Joseph C. Aub and Robert S. Grier, April, 616
—blood changes in luminizers using radioactive material (ab), Ethel Browning, Feb., 312
—causes of dyspnea in chronic pulmonary granulomatosis in beryllium workers (ab), Robert A. Bruce, et al, March, 450
—tuberculosis in industry: an epidemiological study; preliminary report (ab), Alice Stewart and J. P. W. Hughes, April, 615
INFANTS. See Children
INFANTS, NEWBORN
—deep vein thrombosis (ab), Maurice J. Keller, May, 788
—diagnosis of intestinal obstruction; review of literature, with report of 8 additional cases (ab), Everett Carlson, et al, March, 461
—perforation of a gastric ulcer associated with intracranial hemorrhage in a newborn infant, Charles Gottlieb, Florence Chu, and Herbert S. Sharlin, April, 595
—pneumomediastinum (ab), Felix Heald and T. S. Wilder, May, 775
—prevalence and distribution of ossification centers (ab), Amos Christie, Feb., 301
—respiratory emergencies (ab), Willard F. Goff, Jan., 132
INGBER, EDMUND: Paradental autonomous osseous nucleus in the maxilla (ab), Feb., 295
INGRAHAM, C. B., TAYLOR, E. STEWART, and SINTON, ELEANOR: Certain aspects of the uterine cervix cancer problem in Colorado (ab), Feb., 307
INGRAM, M., and BARNES, S. W.: Observations on the blood of cyclotron workers (ab), Jan., 156
INTERNATIONAL CONGRESS OF RADIOLOGY, LONDON, 1950 (Sixth), Feb., 283; March, 435; April, 604
INTERNATIONAL CONGRESS ON DISEASES OF THE CHEST, Feb., 283
INTESTINES
See also Colon; Duodenum; Gastro-Intestinal Tract
—hepato-diaphragmatic interposition of the small intestine, Joseph F. Linsman and Jack I. Chalek, May, 726
—ileal prolapse, Chapin Hawley and James Mithoefer, March, 380
—pneumatosis intestinalis: roentgen diagnosis and surgical management (ab), Albert I. Gazin, et al, April, 622
diverticula
—jejuno-ileal diverticula; review of literature and case reports (ab), Randolph E. Watts and Samuel M. Ramer, March, 461
obstruction. See also Intussusception
—caused by gallstone (ab), Charles W. Mayo and Philip W. Brown, May, 782
—diagnosis in the newborn; review of literature, with report of 8 additional cases (ab), Everett Carlson, et al, March, 461
—due to ascaris (ab), Samuel Skapinker, June, 908
—radiological criteria for removal of intestinal decompression tube, Meyer O. Cantor, April, 535
—spontaneous paralytic ileus (ab), W. B. Roantree, March, 460
roentgenography
—device for roentgen examination of the colon following colostomy, Joseph C. Root and Albert A. Rayle, Jr., May, 732
—double-contrast study of the colon: comparative study of barium sulfate preparations, Robert D. Moreton and Charles W. Yates, April, 541
—method of double-contrast examination of small intestine, Jack Friedman and Leo G. Rigler, March, 365
—roentgen examination of the defunctioned colon after ileostomy, with special reference to the safety and practical value of thorium dioxide as a contrast medium (ab), Harrison J. Shull, et al, May, 781
—small intestinal pattern in sprue and similar deficiency diseases (ab), Alice Ettinger, April, 622
—some observations upon the radiology of the small intestine in old age (ab), H. J. Jungmann and L. Cosin, May, 781
—studies showing induction of a segmentation pattern in the small intestine in normal human subjects (ab), A. C. Frazer, et al, Feb., 299
—study of colon: value of double contrast enema (ab), Robert D. Moreton and Charles W. Yates, Feb., 300
tuberculosis
—streptomycin in treatment of enteritis; 33 cases (ab), Edward F. Mason, et al, May, 781
tumors
—intussusception in adults with small bowel tumors (ab), Robert M. Lowman and William Mendelsohn, Jan., 140
—malignant tumors of small intestine (ab), Irwin E. Siris, April, 621
volvulus
—of cecum (ab), John D. Palmer, April, 622
—of cecum, with review of 100 cases in the literature and report of 6 new cases (ab), J. L. Donhauser and S. Atwell, Jan., 141
—of sigmoid (ab), Lawrence Essenson and Leon Ginzburg, Jan., 141
—of sigmoid colon; case (ab), Albert H. Staderman and Robert E. Booth, Jan., 141
INTUSSUSCEPTION
—in adults with small bowel tumors (ab), Robert M. Lowman and William Mendelsohn, Jan., 140
—treatment of acute intussusception by an enema of roentgenologic contrast medium (ab), Gustaf Lindberg and Olallo Morales, Feb., 300
IODINE AND IODINE COMPOUNDS
—conjunctival and skin tests in the employment of iodine salts as contrast media (ab), Gustaf Notter, Jan., 150
—new series of radiopaque compounds. II. Further notes on the cholecystographic uses of certain iodinated hydroxyphenyl fatty acids, Bernard S. Epstein, Hyman L. Cohen, and Samuel Natelson, Jan., 87
radioactive. See Radioactivity
toxicity
—delayed pneumonia and urticaria following bronchography (ab), H. E. Bass, March, 448
IODOBIL. See Gallbladder
IONIZATION CHAMBERS
—observations on the ionization produced by high-voltage radiation in moulded ionization chambers with walls of various effective atomic numbers (ab), Samira M. Aly and C. W. Wilson, April, 635
IREY, NELSON S. See **SCHWARTZ, JACK W.**
IRWIN, GEORGE E., Jr. See **BARTH, EARL E.**
ISAAC, FRANK. See **WILKINS, FRANKLIN B.**
ISAACSON, ALVIN S., and WHITEHOUSE, WALTER M.: Spontaneous sacro-iliac obliteration in patients with tuberculosis (ab), March, 466
ISOTOPES. See Radioactivity
ISTITUTO DI RADIOLOGIA DELL'UNIVERSITA, GENOA, ITALY, May, 755

J

JACKSON, FREDERIC S. See **DOTTER, CHARLES T.**
JACKSON, HENRY M. See **NELSON, WOODROW**
JACOBS, ARTHUR: Symposium: Carcinoma of the bladder. I. Treatment of cancer of the bladder by radium (ab), June, 922
JACOBSON, LEON O., STONE, R. S., and ALLEN, J. GARROTT: Physicians in an atomic war (ab), May, 802
JAMES, W. R. L. See **GOUGH J.**
JAMPOLIS, ROBERT W. See **FRITZ, JAMES M.**
JANES, ROBERT M. See **ALEXANDER, EBEN, Jr.**
JAPHA, E. M.: Treatment of retinal glioma (ab), March, 473
JAUERNIG, RUSSELL. See **FRIEDMAN, LOUIS J.**
JAUNDICE
—congenital hemolytic jaundice in a Negro family (ab), J. Churg and M. Rosenbaum, March, 446
JAWS
—paradental autonomous osseous nucleus in the maxilla (ab), Edmund Ingber, Feb., 295
—sarcoma in irradiated mandible; case (ab), Sigvard Kaae and Mogens Glahn, May, 801

JEANNERET, RENÉ, KOVATS, FRANÇOIS, and NICOD, FRANÇOIS: A useful procedure in tomographic exploration of the bronchi (ab), May, 770
JEFFERSON, NELSON C.: Cancer, gumma and tuberculosis of the forearm (ab), Jan., 146
JEJUNUM. See Intestines
JELLISON, WILLIAM L. See **HUEBNER, ROBERT J.**
JEMERIN, EDWARD E.: Cholecystitis emphysematosa (ab), Jan., 142
JENKINS, R. TABER. See **HODGES, PAUL C.**
JENNINGS, W. ALAN: Rotational roentgen therapy in the horizontal plane. Part II. Practical application of the method from the physics standpoint (ab), April, 634
JENTZER, A., and CLERC, R.: Treatment of cancer of the breast (Halsted amputation, radium seeding, radium-bearing corset; personal method) (ab), June, 921
JEZER, ABRAHAM. See **GROSS, HARRY**
JODURON. See Uterus
JÖNSSON, GUNNAR: Thoracic aortography by means of a cannula inserted percutaneously into the common carotid artery (ab), May, 779
JOHANNSEN, H. See **CHATTON, P.**
JOHNSON, CLIVE R., CLAGETT, O. THERON, and GOOD, C. ALLEN: Importance of exploratory thoracotomy in the diagnosis of certain pulmonary lesions (ab), Jan., 131
JOHNSON, FERRELL H., and KEARNEY, EDWARD A.: Vagus neurectomy in peptic ulcer. Analyses of 60 cases (ab), April, 621
JOHNSON, J. ROBERT: Situs inversus with associated abnormalities: review of the literature and report of three cases (ab), Jan., 142
JOINTS
See also under names of joints, as Knee; Shoulder
—calcium deposits in the vicinity of the shoulder and other joints (ab), J. Albert Key, May, 784
—rheumatoid (Marie-Strümpell) spondylitis. Technic of examination and importance of the costal joints (ab), A. Justin Williams, March, 465
JOLLES, B.: Study of connective-tissue reaction to radiation. The sieve or chess method (ab), March, 476
JONES, CHESTER M. See **SHULL, HARRISON J.**
JONES, D. E. A.: A note on back scatter and depth doses for elongated rectangular x-ray fields (ab), May, 798
JONES, EUGENIA C. See **DUNSTAN, EDGAR M.**
JONES, HARDIN B. See **DOBSON, ERNEST L.**
JONES, HOWARD W., Jr.: Carcinoma of the breast. Present status of therapy (ab), May, 793
——See **GUYTON, WILLIAM L.**
JONES, JACK W. See **ALDEN, HERBERT S.**
JUNGMANN, H. J., and COSIN, L.: Some observations upon the radiology of the small intestine in old age (ab), May, 781
JUPE, M. H.: Cerebral tumours (ab), June, 896
JURISPRUDENCE, MEDICAL. See Medical Jurisprudence
JUTRAS, ALBERT, LEVRIER, PAUL, and LONGTIN, MARCEL: Radiologic study of the paradiaphragmatic esophagus and of the cardia (ab), June, 907

K

KAAE, SIGVARD, and GLAHN, MOGENS: Case of sarcoma in irradiated mandible (ab), May, 801
KALDECK, ROBERT: Lead-containing clay for shielding in roentgen ray treatment of the skin (ab), May, 792
KAMBERG, SAMUEL. See **ABRAMSON, DANIEL J.**
KAPLAN, GUSTAVE. See **ROSWIT, BERNARD**
KAPLAN, HENRY S., and MURPHY, EDWIN D.: Effect of local roentgen irradiation on the biological behavior of a transplantable mouse carcinoma. I. Increased frequency of pulmonary metastasis (ab), April, 637
KARR, JOHN W., GROHOWSKI, A. L., BARON, G. J., STEINHAUSEN, T. B., and SNOW, S. R., Jr.: Carcinoma of the cervix uteri: a study of 328 cases, (ab), Feb., 307
KASDON, S. CHAS.: Pregnancy and Hodgkin's disease, with a report of three cases (ab), Jan., 153
KAVEE, JULIUS. See **STIVELMAN, BARNET P.**
KAY, EARLE B. See **MENDELSOHN, HARVEY J.**
KEARNEY, EDWARD A. See **JOHNSON, FERRELL H.**
KEATING, F. RAYMOND, Jr. See **KELSEY, MAVIS P.**
KELLER, MAURICE J.: Deep vein thrombosis in a newborn infant (ab), May, 788
KELLY, LOLA S. See **DOBSON, ERNEST L.**
KELSEY, MAVIS P., HAINES, SAMUEL F., and KEATING, F. RAYMOND, Jr.: Radioiodine in the study and treatment of thyroid disease: a review (ab), Jan., 154
KENNEDY, BAYLES R. See **GRAYSON, CHARLES E.**
KENNEDY, JOHN D.: Retrosternal dislocation of the clavicle (ab), Jan., 146
KENNEDY, THOMAS J. See **BOWING, HARRY H.**
KERLEY, T. G. See **QUASTLER, H.**
KERMAN, HERBERT D. See **BAYLIN, GEORGE J.**
KERN, RICHARD A., SOLOFF, LOUIS A., SNAPE, WILLIAM J., and BELLO, CARMEN T.: Pericardial effusion: a constant, early and major factor in the cardiac syndrome of hypothyroidism (myxedema heart) (ab), May, 777
KERNER, JOHN A. See **MORTON, DANIEL G.**
KERR, H. DABNEY, March, 435
KERST, D. W. See **QUASTLER, H.**
KERT, MORLEY J. See **COODLEY, EUGENE L.**
KESSEL, A. W. LIPMANN. See **BROMLEY, L. L.**
KETOSTEROIDS. See Urine
KEY, J. ALBERT: Calcium deposits in the vicinity of the shoulder and of other joints (ab), May, 784
KHOO, F. Y.: Congenital pseudarthrosis of the tibia and its relation to fragilitas ossium. Report of a case and review of the literature (ab), May, 787
KIDNEYS
See also Hydronephrosis; Pyelography
—biologic decay periods of sodium in normal man, in patients with congestive heart failure, and in patients with the nephrotic syndrome as determined by Na^{22} as the tracer (ab), Sam Threefoot, et al, Jan., 154
—clinical significance of the hypertonic kidney pelvis in nonspecific pyelitis (ab), Paolo Biondetti, Feb., 306
—easily sterilizable, flexible cassette with intensifying screens, designed for x-ray examination of operatively exposed kidneys (ab), Olle Olsson, May, 792
—hyperchloremic acidosis and nephrocalcinosis; syndrome of pure "lower nephron" insufficiency (ab), Ezra M. Greenspan, Feb., 305
—roentgen observation of perforation of kidney following retrograde pyelography (ab), A. Druckmann and S. Schorr, May, 790
abnormalities
—crossed unfused renal ectopia with tumor (ab), Harry P. Lee, Jan., 148
—solitary renal ectopia and nephrotic syndrome (ab), Ralph H. Kundstadter and Irving J. Shapiro, May, 790
—true right supernumerary kidney diagnosed preoperatively (ab), Charles M. Stewart, Jan., 147
—unusual renal anomaly: combined tandem and horseshoe kidney (ab), Phillip B. Potamps, et al, Jan., 148
calculi
—multiple calculi demonstrating stone level formation (ab), Melville J. Swartz, April, 628
—radioscopy in nephrolithotomy (ab), N. J. Nicholson, Feb., 305
cancer
—parenchymal carcinoma (ab), I. H. Griffiths and A. C. Thackray, June, 917
—report of successful treatment by prolonged preoperative deep x-ray therapy (ab), Eli A. Miller, April, 631
cysts
—radiological signs of polycystic disease (ab), Richard Hickel and Paul Cornet, March, 469
—unilateral polycystic disease (ab), Gordon D. Oppenheimer and Lester Narins, April, 629
fistula. See Fistula, renoduodenal
tumors
—crossed unfused renal ectopia with tumor (ab), Harry P. Lee, Jan., 148
—diagnosis in the adult, David M. Davis, May, 639
—embryoma of contralateral kidney ten years following nephrectomy for Wilms' tumor (ab), Joseph A. Ritter and Earl S. Scott, May, 790
—Wilms' tumor: evaluation of treatment methods, Rolfe M. Harvey, May, 689
KING, ALAN: Tomography as an aid in the diagnosis and treatment of pulmonary tuberculosis (ab), Jan., 133
KING, J. DUDLEY: Spontaneous renoduodenal fistulas, Jan., 82
KINSELLA, V. J.: Ineffectiveness of present-day radiology in diagnosis of carcinoma of the cardiac end of the stomach, with suggestions for improvement (ab), April, 621
KIRSH, DAVID. See **PENDERGRASS, EUGENE P.**
KISIELESKI, W. E. See **SNYDER, R. H.**
KJELLBERG, SVEN R.: Importance of the prone position in the roentgenologic diagnosis of slight mitral disease (ab), Jan., 136
Roentgen examination of the larynx of children suffering from false croup (ab), Jan., 131
——**and RUDHE, ULF:** Fetal renal secretion and its significance in congenital deformities of the ureters and urethra (ab), Feb., 305
——**RUDHE, ULF, and SJÖSTRAND, TORGNY:** Condition of the cardiac volume during pregnancy (ab), Jan., 136
Relation of the cardiac volume to the weight and surface area of the body, the blood volume and physical capacity for work (ab), Jan., 137
KLEIN, C. P. See **SCHNEIDER, MARTIN**
KLINE, PAUL R., and BRODY, EDWIN R.: Scleroma. Review of literature and first report of multiple familial occurrence in the United States (ab), May, 798
KNEE
—calcification of the bursae (ab), Theodore Norley and William H. Bickel, March, 467
—premature epiphysial fusion at knee joint in tuberculous disease of hip (ab), W. Parke, et al, Jan., 147
—studies in the scope of pneumoarthrography as a diagnostic aid, Maruice D. Sachs, Wilbert H. McGaw, and Russell P. Rizzo, Jan., 10
KNEIDEL, JOHN H., SMITH, LESTER A., and BISHOP, ROBERT E.: Unilateral tuberculous abscess of the thoracic spine with roentgen findings of a dumb-bell neurofibroma, Jan., 78
KOCH, DONALD A. See **LAMPE, ISADORE**
KOCH, H. W. See **QUASTLER, H.**
KOENIG, EDWARD C. (obit), March, 438
KOETS, PETER. See **DAVIDSON, ROLAND A.**
KOIRANSKY, HENRY G., ETTMAN, IRVING K., and WHITE, EDWARD L.: Radiologic study of mastoid bone in infants in conjunction with anatomic and pathologic investigations (ab), May, 768

KOVATS, FRANÇOIS. See **JEANNERET, RENÉ**
KRAFT, JOSEPH R.: Diagnostic problem of primary pleural effusions (ab), Feb., 297
KRAUSE, ARLINGTON C. See **GIFFORD, BYRON L.**
KREIDBERG, MARSHALL B. See **DOWNING, DANIEL F.**
KREMEN, ARNOLD J., HUNTER, SAMUEL W., MOORE, GEORGE E., and HITCHCOCK, CLAUDE R.: Distribution of tracer doses of methionine tagged with radiosulfur in normal and neoplastic tissue (ab), Feb. 311
KRIDELBAUGH, WILLIAM W. See **MASON, EDWARD F.**
KRISTIANSEN, K. See **FABRITIUS, H. F.**
KROSNICK, GERALD. See **RITVO, MAX**
KUKER, L. H. See **DILEO, J. L.**
KUNDSTADTER, RALPH H., and SHAPIRO, IRVING J.: Solitary renal ectopia and the nephrotic syndrome (ab), May, 790
KURZ, EDWARD R. H., and FISCHER, ISIDORE: Lutembacher's syndrome associated with subacute bacterial endocarditis. Report of a case (ab), Jan., 136
KURZROK, LAWRENCE. See **WEXLER, DAVID J.**
KUTZ, EUGENE R.: Congenital absence of the patellae (ab), May, 786
KUZELL, WILLIAM C. See **DAVISON, ROLAND A.**
KYMOGRAPHY
See also Electrokymography
—radiokymography in patent ductus arteriosus (ab), K. Shirley Smith and Franklin G. Wood, June, 905
—results with my kymographic method (multiple centers rotating kymography) (ab), Mario Lenzi, May, 791
—roentgen kymography in study of vesico-ureteral reflux (ab), Ayres de Souza, May, 790
—roentgenkymographic study of pulmonary circulation (ab), Ayres de Sousa, et al, Feb., 297
KYRIAKIDES, A. H. See **FALOR, WILLIAM H.**

L

LABOR
—obstetrical injuries to the long bones (ab), Spencer T. Snedecor and Harrison B. Wilson, March, 464
LACUNAR SKULL. See Cranium
LAMARQUE, PAUL. See **TERRACOL, JEAN**
LAME, EDWIN L. See **PENDERGRASS, EUGENE P.**
LAMERTON, L. F. See **STEED, P. R.**
LAMPE, ISADORE, CHREST, CLARENCE P., and KOCH, DONALD A.: Concentrated roentgen therapy of cervical tuberculous lymphadenitis (ab), May, 796
LANDES, RALPH R., and RANSOM, CHARLES L.: Müllerian duct cysts (ab), May, 791
LANG, LEONARD P. See **GORDON, BURGESS**
LANGSTON, HIRAM T. See **ARIEL, IRVING M.**
LANTHANUM. See Radioactivity
LANZL, E. F. See **QUASTLER, H.**
LANZL, L. H. See **QUASTLER, H.**
LAPIDUS, PAUL W., and SALEM, EDWARD P.: Osteoid osteoma: report of a case with probable double lesion (ab), Feb., 303
LARSON, FRANK. See **ERICKSON, THEODORE C.**
LARYNX
—roentgen examination of larynx of children suffering from false croup (ab), Sven R. Kjellberg, Jan., 131
—tomography in disseminated pulmonary tuberculosis (ab), Max E. Galarza, June, 897
cancer
—roentgen therapy in cancer of hypopharynx (ab), François Baclesse, June, 919
—technic for contact radiotherapy (ab), Jean Terracol and Paul Lamarque, March, 471
LAUGE-HANSEN, N., and LYNDRUP, SVEND: Hidrosadenitis axillaris and its roentgen treatment (optimum total dose and intenseness) (ab), Jan., 153
LAUGHLIN, L. S. See **QUASTLER, H.**
LAVALLE, LAWRENCE L., and HAMM, FRANK C.: Osteitis pubis: its diagnosis and treatment (ab), Jan., 145
LAWRENCE, JOHN H., LOW-BEER, B. V. A., and CARPENDER, JAMES W. J.: Chronic lymphatic leukemia. A study of 100 patients treated with radioactive phosphorus (ab), May, 800
——See **MOFFITT, HERBERT C., Jr.**
LAWRENCE, JOHN S. See **CRADDOCK, CHARLES G.**
——See **VALENTINE, WILLIAM N.**
LAWRENCE, LEWIS R. See **SHEINMEL, ARCHIE**
LAWSON, H. M.: Disseminated ossification of the lungs in association with mitral stenosis (ab), Feb., 297
LEASK, A. R. See **NUSSEY, A. M.**
LEE, ALICE. See **STEVENS, CHARLES D.**
LEE, HARRY P.: Crossed unfused renal ectopia with tumor (ab), Jan., 148
LEES, D. H. See **PAULLEY, J. W.**
LEHMANN, C. FERD. See **PIPKIN, J. LEWIS**
LEINER, GEORGE C., and GOLDBERGER, EMANUEL: An unusual case of acquired dextrocardia (ab), April, 618
LEIOMYOMA. See Tumors, myoma
LEMOINE, J. M., and FINET, F.: Bronchial cancer of the lingula (ab), May, 774
LENZI, MARIO: Some recent results with my kymographic method (multiple centers rotating kymography) (ab), May, 791
LEPENNETIER, F., and GRAIN, R.: Osteoporosis circumscripta cranii (osteoporosis circumscripta of Schüller) (ab), May, 768
LEPROSY
—unusual lesion of the talus occurring in leprosy, Paul T. Erickson and A. Mayoral, March, 357
LERNER, HENRY H. See **GAZIN, ALBERT I.**
LEUKEMIA
—actual position of radiotherapy (ab), P. Marquès and P. Bétoulières, June, 923
—chronic leukemia of long duration; with report of 31 cases with duration of over five years (ab), Herbert C. Moffitt, Jr. and John H. Lawrence, March, 474
—chronic lymphatic leukemia; study of 100 patients treated with radioactive phosphorus (ab), John H. Lawrence, et al, May, 800
—in childhood; clinical and roentgen study of 72 cases (ab), John H. Dale, Jr., May, 787
—place of radiotherapy in treatment of chronic lymphoid leukemia (ab), Ronald B. Scott, June, 923
—radiotherapeutic treatment (ab), J. S. Fulton, June, 924
—role of nitrogen mustard (HN2) as a systemic adjunct to radiation therapy of certain malignant diseases (ab), Bernard Roswit and Gustave Kaplan, April, 633
—treatment of leukemia and allied disorders with folic acid antagonists; effect of aminopterin on skeletal lesions, Frederic N. Silverman, May, 665
LEVENE, GEORGE, and BRAGG, ERNEST A., Jr.: An improved type of fluoroscopic foot-switch, March, 428
Mobility of the rectosigmoid: a new diagnostic sign, May, 717
——See **BRAGG, ERNEST A., Jr.**
LEVI, LEO M.: Roentgen treatment of cutaneous carcinoma involving cartilage (ab), Feb., 307
——**and ENGLE, ROBERT B.:** Radiation therapy of acute pancreatitis. Report of twenty-eight cases, April, 576
LEVIN, CYRIL M. See **D'AGOSTINO, JOSEPH V.**
LEVINSON, LOUIS J., BRAMS, WILLIAM M., and LEVINSTONE, B.: Carcinoma of the cervix (ab), April, 630
LEVINSTONE, B. See **LEVINSON, LOUIS J.**
LEVITIN, JOSEPH: Dysplasia of the hip: a factor in the development of static osteoarthropathy (ab), May, 786
LEVRIER, PAUL. See **JUTRAS, ALBERT**
LEWIN, JULIAN R., WYCIS, HENRY T., and YOUNG, BARTON R.: Roentgen diagnosis of herniation of the brain into the spinal canal (Arnold-Chiari deformity) by pantopaque myelography. Report of a case diagnosed preoperatively, April, 591
LICH, ROBERT, Jr., and GRANT, OWSLEY: Retrocaval ureter (ab), June, 917
LICHTENSTEIN, A.: Diagnosis and therapy of congenital heart disease (ab), June, 905
LIGAMENTS
—new method of demonstration of ligamentous changes in lumbago and sciatica (ab), F. K. Fischer, March, 463
—ossification of coracoclavicular ligaments (ab), Francesco Paroni, Jan., 146
LIND, DAVID A., BROWN, J. R., and DuMOND, JESSE W. M.: Precision wave-length measurements of the 1.1 and 1.3 Mev lines of Co60 with the two meter focusing curved-crystal spectrometer (ab), April, 635
LINDBERG, GUSTAF, and MORALES, OLALLO: Treatment of acute intussusception by an enema of roentgenologic contrast medium (ab), Feb., 300
LINDER, HUGH: Intrathoracic gastroenteric cysts (ab), May, 776
LINDGREN, E.: Some aspects on the technique of encephalography (ab), Jan., 130
LINDSAY, JOHN R. See **SCHUKNECHT, HAROLD F.**
LINGULA. See Lungs, cancer
LINSMAN, JOSEPH F., and CHALEK, JACK I.: Hepatodiaphragmatic interposition of the small intestine, May, 726
LIPIODOL. See Sinus Tracts
LIPOCHONDRODYSTROPHY
—gargoylism (ab), H. A. Thomas Fairbank, April, 625
LIPOGRANULOMATOSIS
—lipoid granulomatosis (xanthomatosis) with marked pulmonary fibrosis and cor pulmonale as outstanding manifestations (ab), Samuel J. Schneierson and Louis Schneider, March, 450
LIPOMA. See Tumors, lipoma
LIPS
—routine management of carcinoma (ab), Herbert L. Traenkle, June, 919
LISSNER, H. R. See **GURDJIAN, E. S.**
LIVER
—hepato-diaphragmatic interposition of the small intestine, Joseph F. Linsman and Jack I. Chalek, May, 726
—studies with colloids containing radioisotopes of yttrium, zirconium, columbium, and lanthanum. II. The controlled selective localization of radioisotopes of yttrium, zirconium, and columbium in the bone marrow, liver, and spleen (ab), Ernest L. Dobson, et al, Feb., 311
tumors
—hemangioma; case (ab), John G. Riddler and Gordon F. Madding, April, 631
LIVERUD, KJELL: Tuberculoma—simulating cardiac aneurysm or localized pericardial effusion (ab), June, 899
LIVINGSTON, KENNETH E. See **DECKER, HENRY G.**
LOBOTOMY. See Brain
LOBSENZ, HERBERT. See **FRIEDMAN, LOUIS J.**
LOCKHART, PHILLIP B. See **CAMPBELL, JOHN A.**
LOEFFLER'S SYNDROME. See Lungs
LÖFGREN, OLOV. See **OLSSON, OLLE**
LOMHOFF, IRVING I. See **ABEL, MARTIN S.**

LONGTIN, MARCEL. See **JUTRAS, ALBERT**
LONSDALE, W. H. See **DORAN, F. S. A.**
LOOSER'S ZONES. See Bones
LOUBEYRE, J., FARKAS, E., and SANDRA, M.: Pulmonary syphilis simulating extensive tuberculosis (ab), May, 774
LOURIA, MILTON R.: Intrathoracic sympathoblastoma (ab), June, 899
LOVEJOY, FRANK W., Jr. See **BRUCE, ROBERT A.**
LOWANCE, MASON I. See **DUNSTAN, EDGAR M.**
LOW-BEER, B. V. A. See **LAWRENCE, JOHN H.**
——See **SPISHAKOFF, NATHAN M.**
LOWE, CHARLES U. See **MAY, CHARLES D.**
LOWMAN, ROBERT M., and MENDELSOHN, WILLIAM: Intussusception in adults with small bowel tumors (ab), Jan., 140
LUDWIG, FREDERICK E.: Osteomyelitis caused by Salmonella paratyphi (Bacillus paratyphosus A) (ab), June, 912
LUISADA, ALDO A., and FLEISCHNER, FELIX G.: Fluorocardiography (electrokymography) (ab), May, 778
LUMBAGO. See Backache
LUMINIZERS
—blood changes in luminizers using radioactive material (ab), Ethel Browning, Feb., 312
LUNGS
See also Bronchi; Bronchiectasis; Pleura
—blast injury of the lungs, with report of a case occurring in peace time, Martin Schneider and C. P. Klein, April, 548
—fibrosis of pancreas in infants and children: an illustrated review of certain clinical features with special emphasis on pulmonary and cardiac aspects (ab), Charles D. May and Charles U. Lowe, May, 776
—lipoid granulomatosis (xanthomatosis) with marked pulmonary fibrosis and cor pulmonale as outstanding manifestations (ab), Samuel J. Schneierson and Louis Schneider, March, 450
—segmental and lobular physiology and pathology (ab), Edward D. Churchill, May, 769
—sterile hemopneumothorax caused by softening and perforation of infarct (ab), John M. Masson and Seymour A. Hartman, June, 903
—thoracic complications of amebiasis (ab), Robert R. Shaw, May, 774
—treatment of acute putrid lung abscess with penicillin and sulfadiazine (ab), Barnet P. Stivelman and Julius Kavee, Jan., 134
blood supply. See also Embolism
—roentgenkymographic study of pulmonary circulation (ab), Ayres de Sousa, et al, Feb., 297
calcifications
—correlated study of tuberculin, histoplasmin and coccidioidin sensitivities with pulmonary calcifications in the Rocky Mountain area (ab), W. K. Absher and F. Cline, Jr., May, 771
—disseminated ossification in association with mitral stenosis (ab), H. M. Lawson, Feb., 297
cancer
—bronchial cancer of lingula (ab), J. M. Lemoine and F. Finet, May, 774
—effect of local roentgen irradiation on the biological behavior of a transplantable mouse carcinoma. I. Increased frequency of pulmonary metastasis (ab), Henry S. Kaplan and Edwin D. Murphy, April, 637
—metastatic cancer (ab), Robert C. Pendergrass, March, 452
—tuberculosis and carcinoma of the lung (ab), Archibald C. Cohen, April, 615
—use of interstitial radon seeds and needles in inoperable cancer (ab), Irving M. Ariel, et al, June, 921
cavitation
—cavitary disease (due to less frequent etiological factors), Joseph Stein and Archie Sheinmel, Feb., 219
collapse
—atelectasis of the right upper lobe (ab), J. Tanca Marengo and Julio Mata Martinez, Jan., 136
—bronchographic observations in collapsed lungs (ab), Arquimedes R. Diaz, June, 898
—respiratory emergencies in the newborn (ab), Willard F. Goff, Jan., 132
cysts
—congenital cystic disease in infants and children (ab), Mark M. Ravitch and Janet B. Hardy, June, 898
—cystic disease (ab), O. C. Brantigan, Jan., 135
—cystic disease (ab), J. E. Strode, May, 770
—eosinophilic xanthomatous granuloma with honeycomb lungs (ab), Thomas Parkinson, May, 771
diseases. See also Pneumoconiosis; Pneumonia
—acute idiopathic pulmonary hemosiderosis (ab), Leslie Nancekievill, Feb., 296
—epidemic disease (ab), James C. Cain, June, 903
—general practitioner and the clinical investigation of some chronic diseases (ab), Corrin H. Hodgson and H. Corwin Hinshaw, June, 898
—Hodgkin's disease: roentgen appearance and therapeutic management, Archie Sheinmel, Bernard Roswit, and Lewis R. Lawrence, Feb., 165
—importance of exploratory thoracotomy in the diagnosis of certain pulmonary lesions (ab), Clive R. Johnson, et al, Jan., 131
—suppurative disease (ab), Fred R. Harper, et al, May, 770
dust diseases. See Industry and Occupations; Pneumoconiosis
fistula. See Fistula, arteriovenous
hernia
—case report and review of literature (ab), Jerome J. Hurwich, March, 449
mycosis. See Actinomycosis; Blastomycosis; Coccidioidomycosis
pathology
—clonorchiasis with marked eosinophilia and pulmonary infiltrations; unusual case (ab), George E. Cartwright, Jan., 134
—creeping eruption; case with Loeffler's syndrome (ab), Samuel H. Horton, Jr., June, 903
—Loeffler's syndrome with concomitant nonspecific maculopapular rash; case (ab), I. Louis Hoffman and George S. Huard, June, 903
—pulmonary infiltration associated with sensitivity to histoplasmin; case (ab), Daniel W. Zahn, May, 771
—Q fever—a review of current knowledge (ab), Robert J. Huebner, et al, Feb., 296
—transitory infiltrates in the lungs with eosinophilia (Loeffler's syndrome); review with report of case (ab), Victor F. Woolf and Wilbur J. Gould, May, 773
—transitory infiltration (Loeffler's syndrome) (ab), F. T. Roque, Feb., 297
roentgenography
—bronchographic anatomy (ab), J. Gordon Scannell, March, 446
—image of mid-axillary zone (ab), A. Rosselet, June, 898
—images which simulate pulmonary tuberculosis in children (ab), José M. Mir, Feb., 295
—new method of radiologic exploration of the heart and lungs, and its use in mediastinal tumors (ab), Maurice Marchal, May, 775
—perceptibility of details (ab), G. C. E. Burger, Feb., 295
—photographs at different points of time and in inspiration and expiration (ab), Eelco Huizinga, March, 447
—pulmonary "coin" lesion (ed), Jan., 116
—routine fluororoentgen examinations of hospital admissions from the viewpoint of the radiologist (ab), Abraham Melamed and Alan Fidler, Feb., 295
syphilis
—abnormal radiologic image in course of secondary syphilis (ab), A. Duroux and Duchene, May, 774
—simulating extensive tuberculosis (ab), J. Loubeyre, et al, May, 774
tuberculosis. See Tuberculosis, Pulmonary
tumors
—angiocardiography in the differential diagnosis of neoplasms (ab), Harold Neuhof, et al, Jan., 135
—diagnosis and treatment (ab), Ralph Adams, March, 451
—hamartoma, Ernest A. Bragg, Jr., and George Levene, Feb., 227
—roentgen study of muscle tumors primary in lung, Robert S. Sherman and Bert H. Malone, April, 507
LUTEMBACHER'S SYNDROME. See Mitral Valve
LYDON, F. L., STEPHANIDES, T., and ROBB, T. M.: Ringworm of the scalp. Treatment by x-ray epilation without subsequent local application (ab), April, 633
LYMPH NODES
—late non-tuberculous complications of calcified hilus nodes (ab), Jerome R. Head and Chester W. Moen, June, 900
cancer
—retroperitoneal lymph node dissection in cancer of cervix (ab), Joe V. Meigs, et al, May, 795
tuberculosis
—concentrated roentgen therapy of cervical lymphadenitis (ab), Isadore Lampe, et al, May, 796
LYMPHOCYTES
—effect of roentgen radiation on the production of thoracic duct lymphocytes (ab), William N. Valentine, et al, April, 637
—the lymphocyte: studies on its relationship to immunologic processes in the cat (ab), Charles G. Craddock, Jr., et al, Jan., 156
LYMPHOEPITHELIOMA. See Nasopharynx, cancer
LYMPHOSARCOMA. See Sarcoma, lymphosarcoma
LYNDRUP, SVEND. See **LAUGE-HANSEN, N.**
LYONS, RICHARD H. See **NELIGH, ROSALIE B.**

M

McANALLY, A. K., and DOCKERTY, MALCOLM B.: Carcinoma developing in chronic draining cutaneous sinuses and fistulas (ab), Jan., 143
McCLURE, G. Y. See **QUASTLER, H.**
McCREADY, FRED J., BARGEN, J. ARNOLD, DOCKERTY, MALCOLM B., and WAUGH, JOHN M.: Involvement of the ileum in chronic ulcerative colitis (ab), Jan., 141
McCURRACH, A. C., NORTON, G. I., and BOUCHARD, J.: Subacromial bursitis. Classification and evaluation of the results of roentgen therapy (ab), June, 924
McDERMOTT, JOHN C.: Measurement of the anterior obstetrical sagittal diameter (ab), May, 789
MACDONALD, COLIN: X-ray interpretation of pulmonary tuberculosis in childhood (ab), Jan., 132
McDONALD, JOHN R. See **EATON, L. M.**
McDOWELL, FRANK. See **BROWN, JAMES B.**
McGAW, WILBERT H. See **SACHS, MAURICE D.**
McGUFFIN, WILLIAM HERBERT (obit), Jan., 122
McGUIRE, JOHNSON. See **FELSON, BENJAMIN**
MACHT, STANLEY H.: Modified technic for cholangiography and use of a new contrast medium (rayopake) for visualization of the biliary tree, March, 421

McINTIRE, FLOYD T., and SYKES, EDWIN M., Jr.: Obstruction of the superior vena cava: review of the literature and report of two personal cases (ab), April, 619
McKENZIE, K. G., and DEWAR, F. P.: Scoliosis with paraplegia (ab), April, 626
McLAREN, H. C. See **GILMOUR, MARY D.**
MACLEAN, ALEX, and ROGEN, ALFRED: Mass miniature radiography in the detection of heart disease (ab), June, 903
MACRAE, D. J.: Osteitis fibrosa disseminata (ab), Feb., 301
Spontaneous pneumomediastinum in pregnancy (ab), April, 618
MADDING, GORDON F. See **RIDDLER, JOHN G.**
MAIER, C. See **WEYLAND, W.**
MAJNO, G. See **RUTISHAUSER, E.**
MALÉKI, A. See **CHATTON, P.**
MALONE, BERT H. See **SHERMAN, ROBERT S.**
MANDIBLE. See Jaws
MANN, K. J. See **FLETCHER, C. M.**
MANN, NORMAN. See **ZIMMERMAN, IRVING**
MARBLE, HENRY C., and BISHOP, WILLIAM A.: Intervertebral disk injury. An analysis of one hundred and thirteen industrial cases (ab), Jan., 144
MARCHAL, MAURICE: A new method of radiologic exploration of the heart and lungs, and its use in mediastinal tumors (ab), May, 775
MARFAN'S SYNDROME. See Arachnodactylia
MARIE-STRÜMPELL DISEASE. See Spine, arthritis
MARINELLI, L. D. See **RAWSON, RULON W.**
MARINO, JOHN J. See **GASUL, BENJAMIN M.**
MARKS, JOSEPH H. See **BREAN, HENRY P.**
MARQUÈS, P., and BÉTOULIÈRES, P.: The leukemias. The actual position of radiotherapy (ab), June, 923
MARSHAK, RICHARD H.: Multiple carcinomas of the large bowel, May, 729
——See **GOLDBERGER, MORRIS A.**
MART, JOHN A., POWERS, KENNETH V., and BARTH, EARL E.: Routine photofluorography of the chest (ab), March, 451
MARTIN, N. H. See **NASSIM, J. R.**
MARTINDALE, L. See **GILMOUR, MARY D.**
MARX, F.: An arteriographic demonstration of collaterals between internal and external carotid arteries (ab), Jan., 138
MASON, EDWARD, F., KRIDELBAUGH, WILLIAM W., CROUCH, WILLIAM H., and WARD, MELGIE: Streptomycin in the treatment of tuberculous enteritis. A report of thirty-three cases (ab), May, 781
MASS SURVEYS. See Heart; Lungs; Stomach; Tuberculosis, Pulmonary
MASSON, JOHN M., and HARTMAN, SEYMOUR A.: Sterile hemopneumothorax caused by softening and perforation of a pulmonary infarct (ab), June, 903
MASTER, ARTHUR M., DACK, SIMON, STONE, JACOB, and GRISHMAN, ARTHUR: Differential diagnosis of hiatus hernia and coronary artery disease (ab), March, 456
MASTOID
—radiologic study of mastoid bone in infants in conjunction with anatomic and pathologic investigations (ab), Henry G. Koiransky, et al, May, 768
—roentgen microspectrographic investigation of the inflammatory destruction of the mastoid bone (ab), Arne Engström, et al, May, 768
—squamositis, mastoiditis, and squamomastoiditis (ab), Dominick A. DeLisa, April, 613
MATA MARTINEZ, JULIO. See **TANCA MARENGO, J.**
MAXILLA. See Jaws
MAY, CHARLES D., and LOWE, CHARLES U.: Fibrosis of the pancreas in infants and children. An illustrated review of certain clinical features with special emphasis on the pulmonary and cardiac aspects (ab), May, 776
MAYNARD, EDWIN P., Jr.: The heart in hypertension (ab), April, 618
MAYNEORD, W. V. See **STEED, P. R.**
MAYO, CHARLES W., and BROWN, PHILIP W.: Intestinal obstruction caused by gallstone (ab), May, 782
MAYORAL, A. See **ERICKSON, PAUL T.**
MEASLES
—pneumonia of measles (ab), Louis Weinstein and William Franklin, May, 773
MEDIASTINUM
—defect with interpleural communication observed during pneumothorax therapy; (ab), Isaac Epstein, Jan., 136
—intrathoracic goiter located in posterior mediastinum (ab), Richard H. Sweet, June, 903
cysts
—bronchogenic cyst (ab), J. Exalto and K. Waldeck, Jan., 135
—of gastric origin; case (ab), B. J. Bickford, March, 452
emphysema. See Emphysema
tumors
—(ab), A. R. Curreri and J. W. Gale, May, 775
—lipoma with inclusion of remnants of thymus gland (ab), Paul W. Schanher, Jr., and G. B. Hodge, Feb., 297
—new method of radiologic exploration of the heart and lungs, and its use in mediastinal tumors (ab), Maurice Marchal, May, 775
MEDICAL JURISPRUDENCE
—medicolegal implications and status of fluoroscopy, I. S. Trostler, Feb., 266
MEIGS, JOE V., PARSONS, LANGDON, and NATHANSON, IRA T.: Retroperitoneal lymph node dissection in cancer of the cervix (ab), May, 795
MEISSNER, WILLIAM A. See **SWINTON, NEIL W.**
MELAMED, ABRAHAM, and FIDLER, ALAN: Routine fluororoentgen chest examinations of hospital admissions from the viewpoint of the radiologist (ab), Feb., 295
MENDELSOHN, HARVEY J., and KAY, EARLE B.: Intrathoracic meningocele (ab), Jan., 135
MENDELSOHN, WILLIAM. See **LOWMAN, ROBERT M.**
MENINGES
—diagnosis of chronic subdural hematoma in children and adolescents (ab), J. W. D. Bull, Jan., 130
—distention of the subarachnoid space with cerebrospinal fluid in infants; enlargement of the head and spasticity; surgical correction (ab), Charles Bagley, Jr., et al, April, 613
—subarachnoid hemorrhage (ab), Harold C. Voris, Feb., 294
tumors
—diagnosis of spinal meningiomas and schwannomas by myelography (ab), Ernest H. Wood, Jr., April, 628
MENINGOCELE
—intrathoracic meningocele (ab), Francis X. Byron, et al, May, 776
—intrathoracic meningocele (ab), Harvey J. Mendelsohn and Earle B. Kay, Jan., 135
MENINGOMYELOCELE. See Spina Bifida
MENOPAUSE
—artificial menopause: indications, technic and complications (ab), Mary D. Gilmour, et al, May, 796
MEREDITH, H. CLARKSON, Jr.: Intrathoracic hour-glass ganglioneuroma. A case report (ab), June, 899
MEREDITH, W. J.: Dosage distribution and dosage in carcinoma of the uterine cervix, March, 386
MERRILL, O. E. See **HUNTER, F. T.**
MESCHAN, ISADORE, SCRUGGS, JOE B., Jr., and CALHOUN, JOSEPH D.: Convulsive fractures of the dorsal spine following electric-shock therapy, Feb., 180
METCALFE, JOHN W.: Syphilitic osteoperiostitis—skull, ribs, and phalanges. Report of a case (ab), May, 784
METHIONINE
—distribution of tracer doses of methionine tagged with radiosulfur in normal and neoplastic tissue (ab), Arnold J. Kremen, et al, Feb., 311
MEYER, PAUL D. See **HAWLEY, CHAPIN**
MICHIE, CATHERINE R. See **RING, GORDON C.**
MICRORADIOGRAPHY
—(ab), Arne Engström, May, 791
MICTURITION. See Urination
MILES, PAUL W., and DIXON, JOSEPH M.: Tuberous sclerosis in three siblings (ab), March, 446
MILITARY MEDICINE. See Atomic Energy; Veterans
MILKMAN'S DISEASE. See Bones
MILLEN, J. L. E.: Symposium: Carcinoma of the bladder. III. Treatment by radon seed implantation and deep x-ray therapy (ab), June, 922
MILLER, EARL R. See **BOLDREY, EDWIN**
——See **FREEMAN, NORMAN E.**
MILLER, ELI A.: Renal neoplasms; report of successful treatment by prolonged preoperative deep x-ray therapy (ab), April, 631
MILLER, LEO F., and O'NEILL, COLMAN J.: Myositis ossificans in paraplegics (ab), March, 464
MINERAL OIL. See Pneumonia, lipid
MINERS
—classification of radiographic appearances in coalminers' pneumoconiosis (ab), C. M. Fletcher, et al, June, 902
—comparison of radiologic and pathologic changes in coalworkers' pneumoconiosis (ab), J. Gough, et al, June, 902
MIR, JOSÉ M.: Radiological images which simulate pulmonary tuberculosis in children (ab), Feb., 295
MISTAL, O. M.: Is tuberculosis contagious? Should radiophotography be obligatory? (ab), Jan., 133
MITHOEFER, JAMES. See **HAWLEY, CHAPIN**
MITRAL VALVE
—disseminated ossification of the lungs in association with mitral stenosis (ab), H. M. Lawson, Feb., 297
—dysphagia and mitral valve deformity (ab), Abraham Gootnick, Feb., 298
—hemosiderosis of lung due to mitral disease; 6 cases simulating pneumoconiosis (ab), Eugene P. Pendergrass, et al, March, 449
—importance of the prone position in the roentgen diagnosis of slight mitral disease (ab), Sven R. Kjellberg, Jan., 136
—Lutembacher's syndrome associated with subacute bacterial endocarditis; case (ab), Edward R. H. Kurz and Isidore Fischer, Jan., 136
—stenosis in later life (ab), Harold Cookson, May, 456
MOE, GORDON K. See **NELIGH, ROSALIE B.**
MOEHLIG, ROBERT C.: Arachnodactyly (Marfan's syndrome). Two case reports with etiological implications (ab), May, 783
MOEN, CHESTER W. See **HEAD, JEROME R.**
MOFFITT, HERBERT C., Jr., and LAWRENCE, JOHN H.: Chronic leukemia of long duration: with a report of 31 cases with duration of over five years (ab), March, 474
MOIR, J. CHASSAR: Measuring the obstetric value of the pelvis (use of the "graph method" for the interpretation of radiological findings) (ab), March, 468
MOIR, P. J., and BROCKIS, J. G.: Observations on bone lesions in Hodgkin's disease (ab), March, 463
MONSTERS
—thoracopagus twins: prenatal diagnosis, Charles M. Gray, H. G. Nix, and A. J. Wallace, March, 398
—uniumbilical-dibrachi-dicephalic monster: roentgenographic diagnosis in utero, delivery by low classical cesarean section (ab), Joseph V. D'Agostino, et al, Feb., 305

MONTGOMERY, ANDREW, H., MONTGOMERY, ROYAL M., and MONTGOMERY, DONALD C.: Problem of plantar radiodermatitis (ab), June, 926
MONTGOMERY, DONALD C. See **MONTGOMERY, ANDREW H.**
MONTGOMERY, ROBERT R. See **CHOISSER, ROGER M.**
MONTGOMERY, ROYAL M. See **MONTGOMERY, ANDREW H.**
MOORE, GEORGE E. See **KREMEN, ARNOLD J.**
MOORE, H. D.: A new method of venography with particular reference to its use in varicose veins (ab), June, 915
MOORE, JEFFERY P.: Rhabdomyosarcoma: its dissemination and response to radiation (ab), April, 631
MOORE, SHERWOOD: Mass roentgenological survey of the gastrointestinal tract to detect cancer of the stomach (ab), March, 458
——See **SCOTT, WENDELL G.**
MORALES, OLALLO. See **LINDBERG, GUSTAF**
MORBUS CAERULEUS. See Heart, abnormalities
MORETON, ROBERT D., and YATES, CHARLES W.: Double-contrast study of the colon: a comparative study of barium sulfate preparations, April, 541
Roentgenologic study of the colon. Value of the double contrast enema (ab), Feb., 300
MORETZ, WILLIAM H. See **THOMASON, JAMES R.**
MORGAN, RUSSELL H. See **ROACH, JOHN F.**
MORQUIO'S DISEASE. See Dyschondroplasia
MORRISON, MURRAY CASS (obit), Feb., 286
MORSE, DAN: Detection of various chest lesions by mass x-ray survey (ab), April, 616
MORTON, DANIEL G., and KERNER, JOHN A.: Reactions to x-ray and radium therapy in the treatment of cancer of the uterine cervix (ab), March, 475
MOSCO, LIDIO G. See **di RIENZO, S.**
MOTLEY, HURLEY L. See **GORDON, BURGESS**
MOTTRAM, M. E., and HILL, HAROLD A.: Radiation therapy of ringworm of the scalp (ab), Feb., 309
MOURÃO, MILTON M., and SCHINDLER, RUDOLF: Pancreatic lithiasis and gastritis (cases with gastroscopic observations) (ab), June, 910
MUCIN
—use of gastric mucin as a barium suspension medium; preliminary report, Gilbert H. Alexander and Ralph E. Alexander, June, 875
MUCOCELE. See Frontal Sinus
MÜLLER, J. H.: Human autoradiographs obtained with a radioactive isotope of zinc (ab), May, 801
On the multiple possibilities of a long-life artificially radioactive isotope (Co^{60}), in fluid form, for the radiation therapy of malignant tumors (ab), June, 925
MÜLLERS DUCT
—cysts (ab), Ralph R. Landes and Charles L. Ransom, May, 791
—radiologic aspect of utriculus prostaticus during urethrocystography (ab), Nils P. G. Edling, June, 918
MUELLNER, S. RICHARD: Etiology of stress incontinence (ab), Jan., 148
——**and PLEISCHNER, FELIX G.:** Normal and abnormal micturition: a study of bladder behavior by means of the fluoroscope (ab), Jan., 148
MULHOLLAND, JOHN H. See **RYAN, JOHN D.**
MULLER, C. J. B.: Thyrotrophic exophthalmos (ab), March, 473
MURPHY, EDWIN D. See **KAPLAN, HENRY S.**
MURPHY, ROBERT E. See **THOMAN, WILLIAM S.**
MUSCLES. See Eyes; Tumors, myoma
MYASTHENIA GRAVIS
—thymectomy in treatment; 32 cases (ab), L. M. Eaton, et al, April, 617
MYELOGRAPHY. See Spinal Canal Roentgenography; Spinal Cord, tumors; Spine, intervertebral disks
MYERS, KARL J.: The approach to the x-ray film (ab), May, 792
MYOCARDIUM. See Heart
MYOMA. See Tumors, myoma
MYOSARCOMA. See Sarcoma, myosarcoma
MYOSITIS OSSIFICANS
—in paraplegics (ab), Leo F. Miller and Colman J. O'Neill, March, 464
MYXEDEMA. See Thyroid

N

NABATOFF, ROBERT A. See **NEUHOF, HAROLD**
NADAL, R., DENOUN, P., and BEIX, J.: Roentgen therapy of carcinoma of the breast by long focal distance irradiation (ab), May, 793
NANCEKIEVILL, LESLIE: Acute idiopathic pulmonary haemosiderosis (ab), Feb., 296
NARANS, LESTER. See **OPPENHEIMER, GORDON D.**
NASOPHARYNX
cancer
—carcinoma; 150 cases (ab), Marvin W. Simmons and Irving M. Ariel, May, 794
—roentgen and clinical study of malignancies (lympho-epithelioma and transitional cell carcinoma) (ab), George J. Baylin, et al, May, 769
lymphoid tissue
—irradiation (ab), A. N. Champion, Feb., 309
—radium therapy for lymphoid hyperplasia (ab), George N. Thrift, April, 633
NASSIM, J. R., and MARTIN, N. H.: Masked steatorrhoea revealed by pseudo-fractures (Looser's zones) with some observations on calcium excretion in convalescence (ab), June, 912
NATELSON, SAMUEL. See **EPSTEIN, BERNARD S.**
NATHANSON, IRA T. See **MEIGS, JOE V.**
NATIONAL RESEARCH COUNCIL, announcement, May, 755
NECROSIS. See Femur; Roentgen Rays, injurious effects
NELIGH, ROSALIE B., HOLT, JOHN F., LYONS, RICHARD H., HOOBLER, SIBLEY W., and MOE, GORDON K.: Effects of tetraethylammonium chloride on the human gastrointestinal tract (ab), Jan., 139
NELSON, WOODROW, HATCH, FLOYD F., and JACKSON, HENRY M.: Congenital absence of the gall bladder (ab), May, 783
NEO-IOPAX. See Pyelography
NEPHROLITHOTOMY. See Kidneys, calculi
NEPHRON. See Kidneys
NERVES
—constriction of intervertebral foramen: a cause of nerve root pressure (ab), Lee A. Hadley, June, 912
acoustic
—tumors: review of 250 cases by clinicosurgical study (ab), Herbert Olivecrona and Alfredo Givré, March, 445
spinal
—unilateral tuberculous abscess of the thoracic spine with roentgen findings of a dumb-bell neurofibroma, John H. Kneidel, Lester A. Smith, and Robert E. Bishop, Jan., 78
vagus
—neurectomy in peptic ulcer; analyses of 60 cases (ab), Ferrell H. Johnson and Edward A. Kearney, April, 621
NESSET, W. D. See **FORSGREN, A. L.**
NEUFELD, OTTO J. See **STILSON, WALTER L.**
NEUHAUSER, EDWARD B. D., WITTENBORG, MARTIN H., and DEHLINGER, KLAUS: Diastematomyelia: transfixation of the cord or cauda equina with congenital anomalies of the spine, May, 659
NEUHOF, HAROLD, SUSSMAN, MARCY L., and NABATOFF, ROBERT A.: Angiocardiography in the differential diagnosis of pulmonary neoplasms (ab), Jan., 135
NEUROBLASTOMA. See Tumors, neuroblastoma
NEUROFIBROMA. See Tumors, neurofibroma
NEUROPSYCHIATRY
—lipoid pneumonia in neuropsychiatric and debilitated patients (ab), Arthur A. Humphrey and Edwin G. Olmstead, March, 449
NEUROSURGERY
—role of complete cerebral angiography in neurosurgery (ab), Rupert Raney, et al, April, 613
NEUTRONS. See Radioactivity
NEWBOLD, H. L., WYATT, G. B., and FRIST, T. F.: Aneurysm of the left ventricle secondary to myocardial infarction. Report of a case in a thirty-five-year-old man (ab), March, 454
NEWCOMB, RICHARD V. See **HARE, HUGH F.**
NEWELL, R. R.: Human tolerance for large amounts of radiation, April, 598
NEWMAN, MELVIN M. See **FRITZ, JAMES M.**
NICHOLSON, N. J.: Radioscopy in nephrolithotomy (ab), Feb., 305
NICOD, FRANÇOIS. See **JEANNERET, RENÉ**
NITROGEN MUSTARDS
See also Hodgkin's Disease
—distribution studies in mice following the intravenous injection of diethyl β-iodoethyl amine hydrochloride prepared with radioactive iodine (ab), Arnold M. Seligman, et al, Jan., 156
NIX, H. G. See **GRAY, CHARLES M.**
NOLAN, JAMES F., COSTOLOW, WILLIAM E., and DuSAULT, LUCILLE: Symposium on cancer of the cervix uteri. Radium treatment of carcinoma of the cervix uteri, June, 821
NORCROSS, JOHN R.: Compression fractures of the spine complicated by injury to the spinal cord (ab), Feb., 301
NORLEY, THEODORE, and BICKEL, WILLIAM H.: Calcification of the bursae of the knee (ab), March, 467
NORMAN, IRWIN L., and SHOEMAKER, WILLIAM: Sarcoidosis. Report of six cases (ab), May, 796
NORTON, G. I. See **McCURRACH, A. C.**
NOSE
See also Nasopharynx
—malignant lesions of fossae and sinuses: diagnosis and treatment (ab), Austin T. Smith and Theodore P. Eberhard, May, 794
—postirradiation osteogenic sarcoma of nasal bone; 2 cases (ab), John J. Wolfe and William R. Platt, April, 637
NOTTER, GUSTAF: Conjunctival and skin tests in the employment of iodine salts as contrast media (ab), Jan., 150
NUSSEY, A. M., and LEASK, A. R.: Trichobezoar (ab), March, 460
NYLIN, G., and HEDLUND, S.: Further studies of the circulation with radioactive erythrocytes (ab), March, 475

O

OAK RIDGE INSTITUTE OF NUCLEAR STUDIES
—radioisotopes technics courses, Jan., 119; March, 435
O'BANNON, R. P.: The gastric rugae (ab), March, 458
OBITUARIES
Coutard, Henri, May, 758
Koenig, Edward, C., March, 438

OBITUARIES—*cont.*
McGuffin, William Herbert, Jan., 122
Morrison, Murray Cass, Feb., 286
O'BRIEN, FREDERICK W.: Roentgen therapy and the relief of pain, Jan., 1
OCCIPITAL BONE
—platybasia associated with an unusual case of pulmonary tuberculosis; case with necropsy (ab), Isaac Epstein, April, 613
O'CONNOR, A. D. See **STEED, P. R.**
OLD AGE
—pulmonary tuberculosis in the elderly (ab), Keith H. Hallam, Jan., 133
—some observations upon the radiology of the small intestine in old age (ab), H. J. Jungmann and L. Cosin, May, 781
OLIVECRONA, HERBERT, and GIVRÉ, ALFREDO: Tumors of the acoustic nerve: review of 250 cases by clinicosurgical study (ab), March, 445
OLMSTEAD, EDWIN G. See **HUMPHREY, ARTHUR A.**
OLNICK, HERBERT M., and WEENS, H. STEPHEN: Roentgen manifestations of infantile hypertrophic pyloric stenosis (ab), May, 779
OLSEN, ARTHUR M., and HINSHAW, H. CORWIN: Tuberculosis of the trachea and major bronchi. Results of treatment with streptomycin (ab), June, 899
OLSSON, OLLE: An easily sterilizable, flexible cassette with intensifying screens, designed for x-ray examination of operatively exposed kidneys (ab), May, 792
——See **BROMAN, TORE**
——**and LÖFGREN, OLOV:** Hyaluronidases as a factor hastening the spread and absorption of water-soluble radiopaque substances deposited intracutaneously, subcutaneously, or intramuscularly (ab), Feb., 306
OMENTUM
—fluid in the lesser omental sac as a cause of extragastric pressure defect (ab), Sol Glotzer, June, 908
—radiologic diagnosis of epilopericolitis (ab), S. di Rienzo and Lidio G. Mosco, June, 909
O'NEILL, COLMAN J. See **MILLER, LEO F.**
O'NEILL, HUGH A. See **TALLANT, EDWARD J.**
OOSTHUIZEN, S. F., and FAINSINGER, M. H.: Pulmonary actinomycosis (ab), Feb., 296
OPHTHALMOLOGY
See also Eyes
—beta radiation therapy (ab), A. D. Ruedemann, Jan., 154
OPPENHEIMER, GORDON D., and NARINS, LESTER: Unilateral polycystic kidney disease (ab), April, 629
OPPENHEIMER, M. J. See **RING, GORDON C.**
O'RAHILLY, R.: Stereoradiographic reconstruction of developing carpus (ab), Jan., 146
ORTIZ, MANUEL HIGINIO, and BRODIE, ALLAN G.: On the growth of the human head from birth to the third month of life (ab), March, 445
ORTMAYER, MARIE, and CONNELLY, MARIE: A study of the colon of apparently well women (ab), April, 622
OS CALCIS. See Calcaneum
OS TRIANGULARE. See Ulna
OSBORN, S. B., and WRIGHT, H. PAYLING: A method of estimating the time at which a counting rate changes, using a Geiger-Müller counter (ab), Jan., 138
——See **WRIGHT, H. PAYLING**
OSMOND, JOHN D., Jr., and PORTMANN, U. V.: Subacute (pseudotuberculous, giant cell) thyroiditis and its treatment (ab), May, 798
OSTEITIS
See also Pubic Bone; Ribs; Spine
deformans
—hyperparathyroidism—simulating Paget's disease (ab), Sidney P. Zimmerman, Feb., 301
fibrosa
—osteitis fibrosa disseminata (ab), D. J. MacRae, Feb., 301
OSTEOARTHRITIS. See Hip; Spine
OSTEOCHONDRITIS DISSECANS
—of head of femur (ab), Forrest L. Flashman and Ralph K. Ghormley, May, 786
OSTEOCLASTOMA. See Tumors, myeloma
OSTEOMA. See Tumors, osteoma
OSTEOMYELITIS
—caused by Salmonella paratyphi (bacillus paratyphosus A) (ab), Frederick E. Ludwig, June 912
OSTEOPERIOSTITIS. See Bones, syphilis
OSTEOPOROSIS. See Cranium; Pelvis
OSTEOSCLEROSIS
—hereditary, multiple, diaphyseal sclerosis (ab), S. Ribbing, May, 784
OSTEOTOMY. See Fibula
OSTRUM, HERMAN W. See **PENDERGRASS, EUGENE P.**
OTITIS MEDIA
—eustachian tube irradiation (ab), Edmund P. Fowler, Jr., Jan., 153
OTTOMAN, RICHARD E. See **WILKINS, FRANKLIN B.**
OVARY
cancer
—treatment of advanced carcinoma (ab), B. Z. Cashman and E. V. Helsel, Feb., 307
irradiation
—response of germ cells to gonadotropic hormones in x-ray injured ovaries of young white mice (ab), J. M. Essenberg, Jan., 156
—treatment of secondary amenorrhea with low dosage irradiation of ovaries and pituitary gland (ab), P. Lyon Playfair and Alan Booth, March, 474
OVERHOLT, RICHARD H., and RAMSEY, BEATTY H.: Discretion in the use of bronchography (ab), May, 769
OWEN, J. T. See **SPEARS, GEORGE N.**

P

PACK, GEORGE T. See **SCHARNAGEL, ISABEL M.**
PAGET'S DISEASE. See Osteitis deformans
PAIN
See also Hip
—roentgen therapy (ab), Origène Dufresne, Feb., 310
—roentgen therapy and the relief of pain, Frederick W. O'Brien, Jan., 1
—unfused ossification centers associated with pain in the adult (ab), Paul C. Swenson and Daniel Wilner, Feb., 300
PAINTER, ELIZABETH E., and BRUES, AUSTIN M.: The radiation syndrome (ab), May, 801
PALMER, EDDY D.: A consideration of certain sources of error in the positive diagnosis of gastric carcinoma (ab), June, 908
PALMER, JAMES P., SADUGOR, MARVIN G., and REINHARD, MELVIN C.: Carcinoma of the vulva. Report of 313 cases (ab), March, 471
——See **SADUGOR, MARVIN G.**
PALMER, JOHN D.: Volvulus of the caecum (ab), April, 622
PANCREAS
—acute pancreatitis following cholangiography (ab), R. L. Zech, June, 910
—diagnosis of chronic recurrent pancreatitis (ab), W. Grafton Hersperger, March, 461
—fibrosis of pancreas in infants and children: an illustrated review of certain clinical features with special emphasis on pulmonary and cardiac aspects (ab), Charles D. May and Charles U. Lowe, May, 776
—lithiasis and gastritis (cases with gastroscopic observations) (ab), Milton M. Mourao and Rudolf Schindler, June, 910
—observations on biliary-pancreatic dynamics in a normal human (ab), John D. Ryan, et al, June, 909
—radiation therapy of acute pancreatitis; 28 cases, Leo M. Levi and Robert B. Engle, April, 576
cancer
—benign pleural effusion and ascites associated with adenocarcinoma of the body of the pancreas (ab), Emil Rothstein, April, 617
PANTOPAQUE. See Spinal Canal Roentgenography
PAPILLON, J. See **DARGENT, M.**
PARAFFIN. See Pneumonia, lipid
PARAPLEGIA
—late renal changes in paraplegia: hydronephrosis due to vesico-ureteral reflux (ab), Herbert S. Talbot and R. Carl Bunts, April, 629
—myositis ossificans in paraplegics (ab), Leo F. Miller and Colman J. O'Neill, March, 464
—neurofibroma: benign intraspinal-intrathoracic "hour-glass" tumor with paraplegia (ab), Eben Alexander, Jr., and Robert M. Janes, Jan., 144
—scoliosis with paraplegia (ab), K. G. McKenzie and F. P. Dewar, April, 626
—spondylitis, pathological ossification, and calcification associated with spinal cord injury (ab), Daniel J. Abramson and Samuel Kamberg, March, 465
PARATHYROID
—hyperparathyroidism—simulating Paget's disease (ab), Sidney P. Zimmerman, Feb., 301
—primary hyperparathyroidism with parathyroid adenoma; case (ab), David V. Elconin and Joseph R. Stone, April, 626
PARKE, W., COLVIN, G. S., and ALMOND, A. H. G.: Premature epiphysial fusion at the knee joint in tuberculous disease of the hip (ab), Jan., 147
PARKER, H. M.: Tentative dose units for mixed radiations, Feb., 257; See correction, April, 604
PARKINSON, JOHN: Radiology of rheumatic heart disease (ab), April, 618
PARKINSON, THOMAS: Eosinophilic xanthomatous granuloma with honeycomb lungs (ab), May, 771
PARONI, FRANCESCO: Ossification of coracoclavicular ligaments (ab), Jan., 146
PARROT'S PSEUDOPARALYSIS. See Pseudoparalysis
PARSONS, LANGDON. See **MEIGS, JOE V.**
PATELLA
—congenital absence (ab), Eugene R. Kutz, May, 786
PAUL, THOMAS O.: Blood groups and effects of roentgen irradiation in retrolental fibroplasia (ab), June, 926
PAULLEY, J. W., LEES, D. H., and PEARSON, A. C.: Cough fracture in late pregnancy (ab), Jan., 146
PEARSON, A. C. See **PAULLEY, J. W.**
PEDIATRICS
—fellowship in pediatric roentgenology, June, 886
PEET MAX M. See **BASSETT, ROBERT C.**
PEIGHTAL, THOMAS C. See **SPEERT, HAROLD**
PELVIS
—osteoporosis of the pelvic bones (acute bone atrophy of Sudeck) (ab), Harold W. Bruskewitz and George H. Ewell, May, 785
measurement
—changing concepts of x-ray pelvimetry (ab), A. E. Colcher and Walter Sussman, Feb., 303
—Chassard-Lapiné and recumbent positions in roentgen measurement of outlet; comparative accuracy, Martin Van Herik and C. Allen Good, March, 392

PELVIS, measurement—*cont.*
—evaluation of radiographic pelvimetric technics (ab), Paul C. Swenson, Feb., 304
—measurement of anterior obstetrical sagittal diameter (ab), John C. McDermott, May, 789
—measuring the obstetric value of the pelvis (use of the "graph method" for interpretation of radiological findings) (ab), J. Chassar Moir, March, 468
—outlet pelvimetry: results in measuring the symphysis-biparietal and sacral-biparietal diameters in 145 primiparous women (ab), Herbert Thoms and Charles B. Cheney, June, 916
PENDERGRASS, EUGENE P., and KIRSH, DAVID: On the occurrence of herpes zoster in carcinoma of the breast (ab), May, 794
——LAME, EDWIN L., and OSTRUM, HERMAN W.: Hemosiderosis of the lung due to mitral disease: report of six cases simulating pneumoconiosis (ab), March, 449
PENDERGRASS, ROBERT C.: Metastatic cancer of the lung (ab), March, 452
PENICILLIN. See Lungs
PEPTIC ULCER
—advantages of small stoma in partial gastrectomy for ulcer; preliminary report (ab), H. W. Porter and Z. B. Claman, March, 459
—perforation of gastric ulcer associated with intracranial hemorrhage in a newborn infant, Charles Gottlieb, Florence Chu, and Herbert S. Sharlin, April, 595
—primary carcinoma of the duodenal bulb mimicking duodenal ulcer (ab), Jameson L. Chassin and J. William Hinton, Jan., 140
—radiological studies of the abdominal aorta in individuals over 50 as an aid to the differential diagnosis between benign and malignant ulceration of the stomach (ab), A. Elkeles, April, 621
—spontaneous pneumoperitoneum (ab), Walter L. Stilson and Otto Neufeld, March, 462
—vagus neurectomy; analyses of 60 cases (ab), Ferrell H. Johnson and Edward A. Kearney, April, 621
PERICARDIUM
—effusion: a constant, early and major factor in the cardiac syndrome of hypothyroidism (myxedema heart) (ab), Richard A. Kern, et al, May, 777
—tuberculoma—simulating cardiac aneurysm or localized pericardial effusion (ab), Kjell Liverud, June, 899
PERIOSTEUM. See Bones
PERKINS, GEORGE: "A broken ankle" (ab), March, 467
PERLMUTTER, MARTHA, and RIGGS, D. S.: Thyroid collection of radioactive iodide and serum protein-bound iodine concentration in senescence, in hypothyroidism and in hypopituitarism (ab), April, 638
PHALANGES. See Fingers and Toes
PHARYNX
See also Nasopharynx
—roentgen therapy in cancer of hypopharynx (ab), François Baclesse, June, 919
PHEOCHROMOCYTOMA. See Adrenals, tumors
PHILLIPS, W. L. See **GREENWOOD, F.**
PHOSPHORUS
radioactive. See Radioactivity
PHOTOFLUOROGRAPHY. See Stomach, cancer; Tuberculosis, Pulmonary
PHOTOTIMER. See Roentgen Rays, apparatus
PHYSICIANS
—in an atomic war (ab), Leon O. Jacobson, et al, May, 802
PICKER, JAMES F., FOUNDATION, May, 755
PICKETT, WILLIAM J. See **FRIEDELL, MORRIS T.**
——See SCHAFFNER, FENTON
PIEMONTE, MAURO: Difficulty of differential diagnosis between primary and secondary tumors of bone (ab), Jan., 143
PIEQUET, J. See **THOYER-ROZAT, P.**
PILLOW, RANDOLPH P., and FINNEGAN, THEODORE E.: Recognition of the late pulmonary residuals of coccidioidomycosis (ab), June, 901
PINES, BERNARD. See **RABINOVITCH, JACOB**
PIPKIN, J. LEWIS, LEHMANN, C. FERD, and RESSMANN, ARTHUR: Treatment of plantar warts by single dose method of roentgen ray (ab), Feb., 309
PIRANI, CONRAD L., EWART, FRED E., Jr., and WILSON, AUDREY L.: Thromboendarteritis with multiple mycotic aneurysms of branches of the pulmonary artery, (ab), March, 453
PITUITARY BODY
—Cushing's disease—pituitary basophilism. Caldwell lecture, 1947 (ab), Merrill C. Sosman, June, 920
—growths in the pituitary and trachea following radiotoxic dosages of I^{131} (ab), Aubrey Gorbman, May, 801
—thyroid collection of radioactive iodide and serum protein-bound iodine concentration in senescence, in hypothyroidism and in hypopituitarism (ab), Martha Perlmutter and D. S. Riggs, April, 638
—treatment of secondary amenorrhea with low dosage irradiation of ovaries and pituitary gland (ab), P. Lyon Playfair and Alan Booth, March, 474
PLACENTA
—x-ray visualization: experiences with soft-tissue and cystographic technics in diagnosis of placenta praevia (ab), Charles S. Stevenson, June, 916
PLASMOCYTOMA. See Tumors, plasmocytoma
PLATT, WILLIAM R. See **WOLFE, JOHN J.**
PLATYBASIA. See Atlas and Axis
PLAYFAIR, P. LYON and BOOTH, ALAN: Treatment of secondary amenorrhoea with low dosage irradiation of ovaries and pituitary gland (ab), March, 474
PLEURA
—benign pleural effusion and ascites associated with adenocarcinoma of the body of the pancreas (ab), Emil Rothstein, April, 617
—diagnostic problem of primary effusions (ab), Joseph R. Kraft, Feb., 297
—mediastinal defect with interpleural communication observed during pneumothorax therapy; case (ab), Isaac Epstein, Jan., 136
empyema. See Empyema
PLUMMER-VINSON SYNDROME. See Dysphagia
PLUTONIUM
See also Radioactivity
—late effects of radium and plutonium on bone (ab), Margaret A. Bloom and William Bloom, April, 636
PNEUMOARTHROGRAPHY. See Knee
PNEUMOCEPHALUS
—traumatic pneumocephalus, Earl E. Barth and George E. Irwin, Jr., March, 424
PNEUMOCONIOSIS
—anthracosilicosis and its symptomatic treatment (ab), Burgess Gordon, et al, May, 772
—benign pneumoconiosis in a tin oxide recovery plant (ab), Harold C. Cutter, et al, April, 616
—classification of radiographic appearances in coalminers' pneumoconiosis (ab), C. M. Fletcher, et al, June, 902
—comparison of radiologic and pathologic changes in coalworkers' pneumoconiosis (ab), J. Gough, et al, June, 902
—hemosiderosis of lung due to mitral disease; 6 cases simulating pneumoconiosis (ab), Eugene P. Pendergrass, et al, March, 449
—silicosis (ab), J. Marsh Frère, March, 450
PNEUMOMEDIASTINUM. See Emphysema
PNEUMONIA
See also Pneumonitis
—delayed pneumonia and urticaria following bronchography (ab), H. E. Bass, March, 448
—pneumonia of measles (ab), Louis Weinstein and William Franklin, May, 773
—primary atypical pneumonia: report on 14 cases observed at the Royal Adelaide Hospital (ab), P. W. Verco, Jan., 134
lipid
—following protracted use of liquid paraffin as nose drops (ab), P. H. Rossier and A. Buhlmann, June, 903
—in neuropsychiatric and debilitated patients (ab), Arthur A. Humphrey and Edwin G. Olmstead, March, 449
—pulmonary hazard of the ingestion of mineral oil in the apparently healthy adult: a clinicoroentgenologic study, with report of 5 cases (ab), Louis Schneider, Feb., 296
PNEUMONITIS
See also Pneumonia
—acute dermatitis and pneumonitis in beryllium workers; review of 406 cases in 8-year period with follow-up on recoveries (ab), Joseph M. DeNardi, et al, May, 772
—acute pneumonitis in a beryllium worker (ab), G. Riddell Royston, May, 772
—acute pneumonitis in workers exposed to beryllium oxide and beryllium metal (ab), Joseph C. Aub and Robert S. Grier, April, 616
PNEUMOPERITONEUM
—spontaneous pneumoperitoneum (ab), Walter L. Stilson and Otto J. Neufeld, March, 462
PNEUMOTHORAX. See Tuberculosis, Pulmonary
POHLE, ERNST A., and FRANK, RALPH C.: Radiation osteitis of the ribs. Report of a case with fractures appearing four and one-half years and eleven years after therapy (ab), June, 926
POLLAK, ALOIS: Angiosarcoma of the sternum (ab), March, 472
POLYARTHRITIS. See Arthritis
PONSETI, IGNACIO V., and FRIEDMAN, BARRY: Evolution of metaphyseal fibrous defects (ab), June, 914
PONTOCAINE. See Bronchi
POOL, J. LAWRENCE: Differential diagnosis of spinal cord lesions (ab), March, 470
POPPE, ERIK: Osteogenic sarcoma—along what lines should it be treated? (ab), April, 632
PORTER, H. W., and CLAMAN, Z. B.: A preliminary report on the advantages of a small stoma in partial gastrectomy for ulcer (ab), March, 459
PORTIER. See **AUBRY**
PORTMANN, U. V. See **OSMOND, JOHN D., Jr.**
POTAMPA, PHILLIP B., HYMAN, MILTON D., and CATLOW, CHARLES E.: An unusual renal anomaly: combined tandem and horseshoe kidney (ab), Jan., 148
POTTS, WILLIS J. See **DAMMANN, J. F., Jr.**
POULHÈS, J.: Ossification centers of the lower limb in an infant of two years (ab), March, 464
POWELL, CHESTER B. See **SUGAR, OSCAR**
POWERS, KENNETH V. See **MART, JOHN A.**
PREGNANCY
See also Craniometry; Pelvis, measurement; Placenta
—carcinoma of cervix concomitant with pregnancy (ab), Marvin G. Sadugor, et al, April, 630
—condition of the cardiac volume during pregnancy (ab), Sven R. Kjellberg, et al, Jan., 136
—cough fracture in late pregnancy (ab), J. W. Paulley, et al, Jan., 146

PREGNANCY—*cont.*
—fetal tolerance to roentgen rays; case, Arthur A. Hobbs, Jr., Feb., 242
—influence of uterus on ureter during pregnancy (ab), W. Rabinowitsch, Feb., 304
—measurement of the rate of venous blood-flow in the legs of women at term and in the puerperium, using radioactive sodium (ab), H. Payling Wright, et al, Jan., 138
—pregnancy and Hodgkin's disease, with report of 3 cases (ab), S. Chas. Kasdon, Jan., 153
—sickle-cell anemia and pregnancy (ab), George W. Anderson and Trent Busby, June, 916
—spontaneous pneumomediastinum (ab), D. J. MacRae, April, 618
PRICE, ALISON H. See **TALLANT, EDWARD J.**
PRICE, PHILIP B. See **GAZIN, ALBERT I.**
PRINZMETAL, MYRON, AGRESS, CLARENCE M., BERGMAN, H. C., and SIMKIN, BENJAMIN: Use of radioactive iodine in the treatment of Graves' disease (ab), March, 475
——**CORDAY, ELIOT, SPRITZLER, RAMON J., and FLIEG, WALTER:** Radiocardiography and its clinical applications (ab), May, 778
PROCTITIS. See Rectum
PROSSOR, T. M.: Treatment of giant-cell tumours of bone, with a review of twenty-five cases (ab), April, 632
PROSTATE
—roentgen aspect of atrophy (ab), Nils P. G. Edling, Jan., 149
cancer
—carcinoma: statistical study and evaluation of endocrine therapy, with a preliminary report of an additional method of treatment (irradiation of adrenals) (ab), Harry Q. Gahagan and J. L. Fischman, Feb., 308
PROUDFIT, WILLIAM L., and ERNSTENE, A. CARLTON: Diagnosis of coarctation of the aorta (ab), March, 454
PRUVOST, P., TEYSSIER, BRINCOURT, and GOSSET: Anical bronchiectasis (ab), May, 770
PSENNER, L.: Rare diseases of the frontal sinuses and their diagnosis and differential diagnosis by roentgenograms (ab), March, 446
PSEUDARTHROSIS
—congenital pseudarthrosis of the tibia and its relation to fragilitas ossium; report of case and review of the literature (ab), F. Y. Khoo, May, 787
—diagnosis and repair of pseudarthrosis of spine (ab), Edgar L. Ralston and Walter A. L. Thompson, June, 913
PSEUDOPARALYSIS
—Parrot's syphilitic pseudoparalysis (ab), Otto Fliegel, March, 463
PUBERTY
—polyostotic fibrous dysplasia—Albright's syndrome. Review of the literature and report of 4 male cases, 2 of which were associated with precocious puberty (ab), C. K. Warrick, April, 623
PUBIC BONE
—osteitis (ab), M. Abrams, et al, March, 467
—osteitis pubis (ab), Robert S. Hotchkiss, et al, Jan., 145
—osteitis pubis: diagnosis and treatment (ab), Lawrence L. Lavalle and Frank C. Hamm, Jan., 145
PUERPERIUM
—measurement of the rate of venous blood-flow in the legs of women at term and in the puerperium, using radioactive sodium (ab), H. Payling Wright, et al, Jan., 138
PYELITIS. See Kidneys
PYELOGRAPHY
See also Kidneys
—by rapid injection: description of an improved method and results in 200 cases (ab), Louis J. Friedman, et al, June, 917
—hyaluronidases as a factor hastening the spread and absorption of water-soluble radiopaque substances deposited intracutaneously, subcutaneously, or intramuscularly (ab), Olle Olsson and Olov Lofgren, Feb., 306
—roentgen observation of perforation of kidney following retrograde pyelography (ab), A. Druckmann and S. Schorr, May, 790
—vasomotor response to the intravenous administration of neo-iopax (ab), R. V. Daut and J. Hartwell Dunn, May, 789
PYLORUS
—roentgen manifestations of infantile hypertrophic pyloric stenosis (ab), Herbert M. Olnick and H. Stephen Weens, May, 779

Q

Q FEVER
—review of current knowledge (ab), Robert J. Huebner, et al, Feb., 296
QUADRUPLETS
—quadruplet pregnancy: diagnosis at 17 weeks of gestation (ab), J. Wiley Hartman, Jr., et al, April, 628
QUASTLER, HENRY: Radiotherapy of acne vulgaris: comparative tests of treatment technics, Feb., 247
——**ADAMS, G. D., ALMY, G. M., DANCOFF, S. M., HANSON, A. O., KERST, D. W., KOCH, H. W., LANZL, L. H., LAUGHLIN, L. S., RIESEN, D. E., ROBINSON, C. S., Jr., AUSTIN, V. T., KERLEY, T. G., LANZL, E. F., McCLURE, G. Y., THOMPSON, E. A., and SKAGGS, L. S.:** Techniques for application of the betatron to medical therapy, with report of one case (ab), April, 635
QUERY, RICHARD Z., Jr.: Rheumatoid spondylitis: its early diagnostic features and management (ab), April, 627
QUIMBY, EDITH H. See **WERNER, SIDNEY C.**
QUINLIN, PATRICIA M. See **STEVENS, CHARLES D.**

R

RAAF, JOHN, and BERGLUND, GEORGE: Results of operations for lumbar protruded intervertebral disc (ab), Feb., 302
RABINOVITCH, JACOB, GRAYZEL, DAVID, SWYER, ALFRED J., and PINES, BERNARD: Benign nonepithelial tumors of the stomach (ab), March, 460
RABINOWITSCH, W.: Influence of the uterus on the ureter during pregnancy (ab), Feb., 304
RADIATIONS
See also Atomic Energy; Radioactivity; Radium; Radon; Roentgen Rays
—observations on the ionization produced by high-voltage radiation in moulded ionization chambers with walls of various effective atomic numbers (ab), Samira M. Aly and C. W. Wilson, April, 635
injurious effects. See also Atomic Energy; Radium, injurious effects; Roentgen Rays, injurious effects
—factitial (irradiation) proctitis: clinicopathologic study of 200 cases (ab), Marion S. Craig, Jr., Feb., 311
—ionizing radiation injury: its diagnosis by physical examination and clinical laboratory procedures (ab), Eugene P. Cronkite, May, 801
—malignant tumors of uterine fundus subsequent to irradiation for benign pelvic conditions (ab), Harold Speert and Thomas C. Peightal, Jan., 151
—observations on the blood of cyclotron workers (ab), M. Ingram and S. W. Barnes, Jan., 156
—postirradiation osteogenic sarcoma of the nasal bone: 2 cases (ab), John J. Wolfe and William R. Platt, April, 637
—radiation syndrome (ab), Elizabeth E. Painter and Austin M. Brues, May, 801
—treatment of radiation sickness with adrenal cortical hormone (desoxycorticosterone acetate): preliminary report on 50 cases (ab), Friedrich Ellinger, et al, Feb., 312
RADIOACTIVITY
See also Atomic Energy
—biologic decay periods of sodium in normal man, in patients with congestive heart failure, and in patients with the nephrotic syndrome as determined by Na^{22} as the tracer (ab), Sam Threefoot, et al, Jan., 154
—blood changes in luminizers using radioactive material (ab), Ethel Browning, Feb., 312
—chronic lymphatic leukemia: study of 100 patients treated with radioactive phosphorus (ab), John H. Lawrence, et al, May, 800
—deposition and fate of plutonium, uranium, and their fission products inhaled as aerosols by rats and man (ab), Kenneth G. Scott, et al, June, 925
—distribution of radioactivity in tumor-bearing mice after injection of radioactive iodinated trypan blue (ab), Charles D. Stevens, et al, Feb., 311
—distribution of tracer doses of methionine tagged with radiosulfur in normal and neoplastic tissue (ab), Arnold J. Kremen, et al, Feb., 311
—distribution studies in mice following the intravenous injection of diethyl β-iodoethyl amine hydrochloride prepared with radioactive iodine (ab), Arnold M. Seligman, et al, Jan., 156
—effect of neutron radiation on human testes; case (ab), John N. Robinson and Earl T. Engle, April, 637
—further studies of the circulation with radioactive erythrocytes (ab), G. Nylin and S. Hedlund, March, 475
—human autoradiographs obtained with a radioactive isotope of zinc (ab), J. H. Müller, May, 801
—measurement of the fate of venous blood-flow in the legs of women at term and in the puerperium, using radioactive sodium (ab), H. Payling Wright et al, Jan., 138
—metabolism of the radioactive elements created by nuclear fission (ab), Joseph G. Hamilton, May, 801
—method of estimating the time at which a counting rate changes, using a Geiger-Müller counter (ab), S. B. Osborn and H. Payling Wright, Jan., 138
—on the multiple possibilities of a long-life artificially radioactive isotope (Co^{60}), in fluid form, for the radiation therapy of malignant tumors (ab), J. H. Müller, June, 925
—present status of radiotherapy and radioisotopes in treatment of cancer (ab), M. Weinbren, June, 919
—radioactive iodine: its use in studying certain functions of normal and neoplastic thyroid tissues (ab), Rulon W. Rawson, et al, Feb., 310
—radioactive isotopes in the study of peripheral vascular disease. I. Derivation of a circulatory index (ab), Morris T. Friedell, et al, May, 799
—radioactive isotopes in the study of peripheral vascular disease. II. Method of evaluation of various forms of treatment (ab), Fenton Schaffner, et al, May, 799
—radiocardiography and its clinical applications (ab), Myron Prinzmetal, et al, May, 778
—radioiodine in the study and treatment of thyroid disease: a review (ab), Mavis P. Kelsey, et al, Jan., 154
—radioisotopes technics courses, Oak Ridge Institute of Nuclear Studies, Jan., 119; March, 435
—recommendation of American Academy of Pediatrics on radioactive isotopes, May, 755

RADIOACTIVITY—*cont.*
—relative biological effectiveness of beta and roentgen radiation as shown by the radiotoxicity of Na^{24} for mice, R. H. Snyder and W. E. Kisieleski, May, 743
—studies of the eye with radiosodium autographs (ab), Ludwig von Sallmann, et al, April, 638
—studies with colloids containing radioisotopes of yttrium, zirconium, columbium, and lanthanum. I. Chemical principles and methods involved in preparation of colloids of yttrium, zirconium, columbium, and lanthanum (ab), John W. Gofman, Feb., 311; II. The controlled selective localization of radioisotopes of yttrium, zirconium, and columbium in the bone marrow, liver, and spleen (ab), Ernest L. Dobson, et al, Feb. 311
—study of peripheral vascular disease with radioactive isotopes (ab), F. W. Cooper, et al, May 799
—theoretic considerations of biologic decay rates of isotopes (ab), George E. Burch, et al, Jan., 154
—thyroid collection of radioactive iodide and serum protein-bound iodine concentration in senescence, in hypothyroidism and in hypopituitarism (ab), Martha Perlmutter and D. S. Riggs, April, 638
—tumorous growths in the pituitary and trachea following radiotoxic dosages of I^{131} (ab), Aubrey Gorbman, May, 801
—units of radioactivity, Jan., 118
—uptake of radioactive phosphorus by malignant brain tumors (ab), Theodore C. Erickson, et al, May, 800
—use of radioactive iodine in the treatment of Graves' disease (ab), Myron Prinzmetal, et al, March, 475
—use of radioisotopes in medical practice (ed), R. R. Newell, May, 752
—use of tracer doses of radioactive iodine, I^{131}, in the study of normal and disordered thyroid function in man (ab), Sidney C. Werner, et al, March, 474
RADIOLOGICAL SOCIETIES
American Roentgen Ray Society, Jan., 118
Atlanta Radiological Society, May, 755
Cleveland Radiological Society, June, 886
Georgia Radiological Society, June, 886
Los Angeles Radiological Society, Jan., 118; March, 435
Miami Valley Radiological Society, April, 604
Minnesota Radiological Society, June, 886
North Dakota Radiological Society, Jan., 118
Pacific Northwest Radiological Society, April, 604
Philadelphia Roentgen Ray Society, May, 755
Rochester Roentgen Ray Society, Feb., 283
Rocky Mountain Radiological Society, May, 755
St. Louis Roentgen Society, March, 435
secretaries and meeting dates, Jan., 124; Feb., 288; March, 439; April, 607; May, 760; June, 889
Sociedad Radiológica Panameña, June, 886
Tennessee Radiological Society, June, 886
RADIOLOGICAL SOCIETY OF NORTH AMERICA
—new scientific exhibit viewing boxes, C. E. Hufford, March, 435
—president, Warren W. Furey, (ed), Feb., 270
thirty-fifth annual meeting
—(ed), Feb., 272
—Carman lecture: contrast myelography past and present, John D. Camp, April, 477
—commercial exhibits, Feb., 279
—presidential address: the cancer problem (ed), Edgar P. McNamee, March, 430
—refresher courses Feb., 275
—scientific exhibits, Feb., 276
RADIOLOGY
—what further contribution can radiology make to medicine? (ab), W. Walter Wasson, June, 919
RADIOLOGY (journal)
—advisory editorial board (ed), May, 754
RADIOTHERAPY
See also Radiations; Radioactivity; Radium; Roentgen Therapy; under diseases, organs, and regions; etc.
—clinical radiation dosage (ab), Lionel Cohen, Feb., 310
—present position in medical practice (in England) (ab), B. W. Windeyer, May, 798
—tentative dose units for mixed radiations, H. M. Parker, Feb., 257. See correction, April, 604
RADIUM
See also Radiations; Radiotherapy; Radon; under diseases, organs and regions; etc.
—late effects of radium and plutonium on bone (ab), Margaret A. Bloom and William Bloom, April, 636
injurious effects
—reactions to x-ray and radium therapy in treatment of cancer of the uterine cervix (ab), Daniel G. Morton and John A. Kerner, March, 475
—sarcoma in irradiated mandible; case (ab), Sigvard Kaae and Mogens Glahn, May, 801
RADIUS
—fractures of distal end, complicated by fractures of carpal scaphoid (ab), O. D. Chrisman and J. H. Shortell, June, 914
RADON
See also Bladder, cancer; Lungs, cancer; Retina, tumors
—beta radiation therapy (ab), A. D. Ruedemann, Jan., 154
RALSTON, EDGAR L., and THOMPSON, WALTER A. L.: Diagnosis and repair of pseudarthrosis of the spine (ab), June, 913
RAMER, SAMUEL M. See **WATTS, RANDOLPH E.**
RAMES, EUGENE D.: Early diagnosis as the means of tuberculosis control (ab), March, 451
RAMSEY, BEATTY H. See **OVERHOLT, RICHARD H.**
RANEY, AIDAN A. See **RANEY, RUPERT**
RANEY, RUPERT, RANEY, AIDAN A., and SANCHEZ-PEREZ, J. M.: Role of complete cerebral angiography in neurosurgery (ab), April, 613
RANKIN, JOSEPH. See **ALDEN, HERBERT S.**
RANSOM, CHARLES L. See **LANDES, RALPH R.**
RAVITCH, MARK M., and HARDY, JANET B.: Congenital cystic disease of the lung in infants and in children (ab), June, 898
RAWSON, RULON W., SKANSE, BENGT N., MARINELLI, L. D., and FLUHARTY, REX G.: Radioactive iodine: its use in studying certain functions of normal and neoplastic thyroid tissues (ab), Feb., 310
RAYLE, ALBERT A., Jr. See **ROOT, JOSEPH C.**
RAYOPAKE. See Biliary Tract
REASER, PAUL. See **THREEFOOT, SAM A.**
RECTUM
—diagnostic difficulties in rectosigmoid lesions (ab), Vernon B. Blaha and Harry C. Saltzstein, May, 782
—factitial (irradiation) proctitis: clinicopathologic study of 200 cases (ab), Marion S. Craig, Jr., Feb., 311
—mobility of the rectosigmoid: a new diagnostic sign, George Levene and Ernest A. Bragg, Jr., May, 717
cancer
—carcinoma; treatment with very high voltage x-ray therapy (ab), I. G. Williams, March, 471
REEVES, ROBERT J. See **BAYLIN, GEORGE J.**
REICH, STANLEY B.: Sarcoma of the uterus: a report of nine cases (ab), May, 795
REINHARD, MELVIN C. See **PALMER, JAMES P.**
—See **SADUGOR, MARVIN G.**
RESANO, H. See **BONORINO UDAONDO, C.**
RESPIRATORY TRACT
See also Bronchi; Lungs; Nasopharynx; etc.
—constricting vascular rings; 2 cases with recurrent respiratory infections (ab), Merl J. Carson and James Goodfriend, Jan., 136
—photographs at different points of time in inspiration and expiration (ab), Eelco Huizinga, Feb., 447
—respiratory emergencies in the newborn (ab), Willard F. Goff, Jan., 132
RESSMANN, ARTHUR. See **PIPKIN, J. LEWIS**
RETINA
tumors
—retinoblastoma (retinal glioma) cured by radon seeds; case (ab), Joseph Waldman and C. E. G. Shannon, Jan., 150
—treatment of glioma (ab), E. M. Japha, March, 473
RETINOBLASTOMA. See Retina, tumors
RHABDOMYOSARCOMA. See Sarcoma, myosarcoma
RHEUMATIC FEVER
—radiology of rheumatic heart disease (ab), John Parkinson, April, 618
RHINOSCLEROMA
—review of literature and first report of multiple familial occurrence in the United States (ab), Paul R. Kline and Edwin R. Brody, May, 798
RIBA, G.: A case of bilateral os triangulare carpi (ab), March, 467
RIBBING, S.: Hereditary, multiple, diaphyseal sclerosis (ab), May, 784
RIBS
—congenital malformation of vertebrae (hemivertebrae) with aplasia of corresponding ribs, associated with a lateral meningomyelocele; case (ab), I. Ralph Goldman, Jan., 144
—radiation osteitis; case with fractures appearing 4½ and 11 years after therapy (ab), Ernst A. Pohle and Ralph C. Frank, June, 926
—unusual lesion (monostotic fibrous dysplasia) (ab), Ernst Theilkäs, March, 466
fractures
—cough fracture in late pregnancy (ab), J. W. Paulley, et al, Jan., 146
—cough fracture (in patients with pulmonary tuberculosis) (ab), Raymond C. Cohen, Jan., 146
syphilis
—osteoperiostitis—skull, ribs, and phalanges (ab), John W. Metcalfe, May, 784
tumors
—eosinophilic granuloma; case observed for 8 years (ab), Austin R. Grant, et al, March, 466
—solitary plasmocytoma (ab), H. Holden, Feb., 303
RICHARDS, G. G., and CROCKETT, K. A.: Hiatus hernia (ab), March, 456
RICHES, E. W.: Symposium: Carcinoma of the bladder. II. Some further aspects of treatment (ab), June, 922
RICHMOND, J. JACKSON: Cerebral tumours (ab), June, 896
RICKETTSIA. See Q Fever
RICKFORD, BRAITHWAITE: Treatment of carcinoma of the body of the uterus (ab), Jan., 152
RIDDLER, JOHN G., and MADDING, GORDON F.: Hemangioma of the liver. Report of a case (ab), April, 631
RIEMENSCHNEIDER, PAUL. See **DEHLINGER, KLAUS**
di RIENZO, S., and MOSCO, LIDIO G.: Radiologic diagnosis of epilopericolitis (ab), June, 909
RIESEN, D. E. See **QUASTLER, H.**
RIGGINS, H. McLEOD, and HINSHAW, H. CORWIN: Streptomycin-tuberculosis research project of the American Trudeau Society. A summary report (ab) Jan. 331
RIGGS, D. S. See **PERLMUTTER, MARTHA**

RIGLER, LEO G., Joseph Freedman lecturer, University of Cincinnati, March, 435
RIGLER, LEO G.: The possibilities and limitations of roentgen diagnosis. Pancoast lecture (ab), May, 777
——See **FRIEDMAN, JACK**
RING, GORDON C., BALABAN, MIRIAM, and OPPENHEIMER, M. J.: Measurements of heart output by electrokymography (ab), June, 904
——**MICHIE, CATHERINE R., and OPPENHEIMER, M. J.:** Starling's law and x-ray density changes of heart shadow (ab), Feb., 297
RINGWORM
—of scalp: treatment by x-ray epilation without subsequent local application (ab), F. L. Lydon, et al, April, 633
—radiation therapy of ringworm of scalp (ab), M. E. Mottram and Harold A. Hill, Feb., 309
RINKER, J. ROBT.: Implanter for radon seeds for use with the McCarthy Foroblique Pan-Endoscope (ab), June, 922
RIOPELLE, J. L.: New elastic fibers formed in the wall of the gallbladder in disease of the gallbladder. Pathologic, clinical and roentgenologic data concerning a hitherto neglected lesion (ab), June, 909
RITTER, JOSEPH A., and SCOTT, EARL S.: Embryoma of contralateral kidney ten years following nephrectomy for Wilms' tumor (ab), May, 790
RITVO, MAX, SHAUFFER, IRVING A., and KROSNICK, GERALD: Clinical and roentgen manifestations of erythroblastosis fetalis (ab), Feb., 304
RIZZO, RUSSELL P. See **SACHS, MAURICE D.**
ROACH, JOHN F., SLOAN, ROBERT D., and MORGAN, RUSSELL H.: Detection of gastric carcinoma by photofluorographic methods. Part I. Introduction. Part II. Equipment design (ab), Jan., 140
ROANTREE, W. B.: Spontaneous paralytic ileus (ab), March, 460
ROBB, T. M. See **LYDON, F. L.**
ROBBINS, L. L. See **HUNTER, F. T.**
ROBERTS, HOWARD G. See **ANDERSON, M. X.**
ROBERTSON, E. GRAEME: Pulsating exophthalmos due to defective development of the sphenoid bone (ab), June, 897
ROBINSON, ALEX: Osteoarthritis of the hip (ab), Feb., 302
ROBINSON, C. S., Jr. See **QUASTLER, H.**
ROBINSON, JOHN N., and ENGLE, EARL T.: Effect of neutron radiation on human testes (ab), April, 637
ROCHE, MAURICE B.: Pathology of neural-arch defects. A dissection study (ab), June, 912
ROENTGEN RAYS
See Body Section Roentgenography; Kymography; Radiations; Roentgen Therapy
—protection of personnel engaged in roentgenology and radiology (ab), F. T. Hunter, et al, June, 925
apparatus
—detection of gastric carcinoma by photofluorographic methods. Introduction. Equipment design (ab), John F. Roach, et al, Jan., 140
—development of the tautograph and the advantages of automatization in cardiovascular angiography (ab), Wendell G. Scott and Sherwood Moore, June, 918
—easily sterilizable, flexible cassette with intensifying screens, designed for x-ray examination of operatively exposed kidneys (ab), Olle Olsson, May, 792
—improved phototimer, Paul C. Hodges, R. Taber Jenkins, and S. F. Williams, Jan., 64
—improved type of fluoroscopic foot-switch, George Levene and Ernest A. Bragg, Jr., March, 428
—improved vertical and horizontal multiple cassette changers for contrast angiography, John A. Campbell and Phillip B. Lockhart, April, 559
—semiautomatic rapid film changer: its use in radiography and the recording of rapid physiological movements (ab), Charles E. Duisenberg, Feb., 306
—standardization of apparatus as affecting radiological interpretation (ab), C. E. Eddy, Jan., 150
diagnosis. See also Roentgen Rays, apparatus; under diseases and organs
—fast radiological visceral survey, C. Gianturco, Jan., 59
—possibilities and limitations. Pancoast lecture (ab), Leo G. Rigler, May, 777
—roentgen diagnosis and clinical responsibility (ed), Leo G. Rigler, June, 884
effects. See also Roentgen Rays, injurious effects
—blood groups and effects of roentgen irradiation in retrolental fibroplasia (ab), Thomas O. Paul, June, 926
—fetal tolerance to roentgen rays; case, Arthur A. Hobbs, Jr., Feb., 242
—further studies on the influence of dose fractionation on the lethal x-ray effect produced by total body irradiation in mice, Friedrich Ellinger and James C. Barnett, Jan., 90
—further studies on the relation between radiation effects, cell viability, and induced resistance to malignant growth. VI. Anomalous radiosensitivities of analogous mouse mammary adenocarcinomas, Anna Goldfeder, Jan., 93
—of local irradiation on the biological behavior of a transplantable mouse carcinoma. I. Increased frequency of pulmonary metastasis (ab), Henry S. Kaplan and Edwin D. Murphy, April, 637
—on production of thoracic duct lymphocytes (ab), William N. Valentine, et al, April, 637
—relative biological effectiveness of beta and roentgen radiation as shown by the radiotoxicity of Na^{24} for mice, R. H. Snyder and W. E. Kisieleski, May, 743
—response of peripheral blood of swine to whole body x-ray radiation in the lethal range (ab), Eugene P. Cronkite, et al, April, 637
—study of connective-tissue reaction to radiation: the sieve or chess method (ab), B. Jolles, March, 476
—the lymphocyte: studies on its relationship to immunologic processes in the cat (ab), Charles G. Craddock, Jr., et al, Jan., 156
films. See Roentgenograms
fluoroscopy. See also Roentgen Rays, apparatus
—characteristics of commercial x-ray screens and films (ab), Willard W. Van Allen, May, 792
—medicolegal implications and status of fluoroscopy, I. S. Trostler, Feb., 266
—persistence of fluoroscopic screens (ab), Willard W. Van Allen, May, 792
injurious effects. See also Radiations, injurious effects
—aseptic necrosis of femoral head following roentgen therapy for carcinoma of the cervix uteri (ab), Stanley D. Simon, March, 476
—dosage-mortality in rats given total body roentgen irradiation (ab), William G. Clark and Rex P. Uncapher, May, 802
—irradiation injury; 3 cases (ab), Sven Hultberg, June, 926
—problem of plantar radiodermatitis (ab), Andrew H. Montgomery, et al, June, 926
—radiation osteitis of ribs; case with fractures appearing $4^1/_2$ and 11 years after therapy (ab), Ernst A. Pohle and Ralph C. Frank, June, 926
—reactions to x-ray and radium therapy in the treatment of cancer of the uterine cervix (ab), Daniel G. Morton and John A. Kerner, March, 475
—relation of exit dose and other dosage factors to injuries (ab), June C. Shafer, et al, April, 635
—response of germ cells to gonadotropic hormones in x-ray injured ovaries of young white mice (ab), J. M. Essenberg, Jan., 156
—surgical treatment of burns (ab), Thomas W. Stevenson, Feb., 312
—surgical treatment of radiation burns (ab), James B. Brown, et al, April, 637
physics. See Roentgen Therapy
stereoscopy
—stereoscopic viewing desk designed for limited space, Desmond T. Burke, May, 750
ROENTGEN THERAPY
See also Cancer, radiotherapy; under organs and regions
—back scatter and depth doses for elongated rectangular x-ray fields (ab), D. E. A. Jones, May, 798
—contribution to study of contact therapy (ab), Jean De Backer, June, 919
—further studies on the influence of dose fractionation on the lethal x-ray effect produced by total body irradiation in mice, Friedrich Ellinger and James C. Barnett, Jan., 90
—relation of exit dose and other dosage factors to roentgen injuries (ab), June C. Shafer, et al, April, 635
—roentgen therapy and the relief of pain, Frederick O'Brien, Jan., 1
—rotational roentgen therapy in the horizontal plane. Part I. General considerations and clinical aspect (ab), Anthony Green, April, 633
—rotational roentgen therapy in the horizontal plane. Part II. Practical application of the method from the physics standpoint (ab), W. Alan Jennings, April, 634
—rotational roentgen therapy in the horizontal plane. Part III. Theoretical considerations, F. Bush, April, 634
high-voltage. See Kidneys, cancer; Rectum, cancer; etc.
ROENTGENOGRAMS
—characteristics of commercial x-ray screens and films (ab), Willard W. Van Allen, May, 792
—x-ray diagnostic file system (ab), John P. Wood, Feb., 306
ROGEN, ALFRED. See **MACLEAN, ALEX**
ROMBOLD, CHARLES. See **WHITE, CHARLES M.**
ROOT, JOSEPH C., and RAYLE, ALBERT A., Jr.: A device for roentgen examination of the colon following colostomy, May, 732
ROQUE, F. T.: Transitory pulmonary infiltration (Loeffler's syndrome) (ab), Feb., 297
ROSE, JOSEPH, and DOOLAN, PAUL D.: Hereditary multiple exostoses (ab), April, 624
ROSENBAUM, M. See **CHURG, J.**
ROSENBERG, HENRY N., and ROSENBERG, I. N.: Simultaneous association of situs inversus, coronary heart disease and hiatus hernia. Report of a case and review of the literature (ab), March, 456
ROSENBERG, I. N. See **ROSENBERG, HENRY N.**
ROSENBERG, LEE S., and SIMPSON, JAMES R.: A simple radiographic technic for cerebral angiography, June, 869
ROSENBERGER, HARRY C.: Radiation therapy for conductive deafness. Report of results and discussion of roentgen and radium irradiation (ab), April, 633
ROSSELET, A.: Radiologic image of the mid-axillary zone (ab), June, 898
ROSSIER, P. H., and BÜHLMANN, A.: Oil pneumonia following protracted use of liquid paraffin as nose drops (ab), June, 903
ROSWIT, BERNARD, and KAPLAN, GUSTAVE: Role of nitrogen mustard (HN2) as a systemic adjunct to the radiation therapy of certain malignant diseases (ab), April, 633
——See **ELLINGER, FRIEDRICH**
——See **SHEINMEL, ARCHIE**

ROTHSTEIN, EMIL: Benign pleural effusion and ascites associated with adenocarcinoma of the body of the pancreas (ab), April, 617
ROTTENBERG, LOUIS A. See **STOUT, ARTHUR P.**
ROYSTON, G. RIDDELL: Acute pneumonitis in a beryllium worker (ab), May, 772
RUDHE, ULF. See **KJELLBERG, SVEN R.**
RUEDEMANN, A. D.: Beta radiation therapy (ab), Jan., 154
RUSSELL, DOROTHY S.: Cerebral tumours (ab), June, 896
RUTENBURG, ALEXANDER M. See **SELIGMAN, ARNOLD M.**
RUTISHAUSER, E., and MAJNO, G.: Osseous lesions through overload on the normal skeleton (experimental results) (ab), March, 462
RYAN, JAMES J. See **ALPERS, BERNARD J.**
RYAN, JOHN D., DOUBILET, HENRY, and MULHOLLAND, JOHN H.: Observations on biliary-pancreatic dynamics in a normal human (ab), June, 909

S

SACHS, MAURICE D., McGAW, WILBERT H., and RIZZO, RUSSELL P.: Studies in the scope of pneumoarthrography of the knee as a diagnostic aid, Jan., 10
SACRO-ILIAC JOINT
—spontaneous sacro-iliac obliteration in patients with tuberculosis (ab), Alvin S. Isaacson and Walter M. Whitehouse, March, 466
SADUGOR, MARVIN G., PALMER, JAMES P., and REINHARD, MELVIN C.: Carcinoma of the cervix concomitant with pregnancy (ab), April, 630
——See **PALMER, JAMES P.**
SAHYOUN, PHILIP F., and EISENBERG, STUART J.: Hodgkin's disease: a histopathological and clinical classification with radiotherapeutic response (ab), Feb., 308
SALEM, EDWARD P. See **LAPIDUS, PAUL W.**
SALIVARY GLANDS
—cranial findings in Sjögren's syndrome (ab), Franco Fossati, May, 768
SALMON, DAVID D. See **COFFEY, JOHN D., Jr.**
SALMONELLA
—osteomyelitis caused by Salmonella paratyphi (Bacillus paratyphosus A) (ab), Frederic E. Ludwig, June, 912
SALTZSTEIN, HARRY C. See **BLAHA, VERNON B.**
SAMPSON, D. ALAN: Significance of symptoms and roentgen studies in urinary tract disease (ab), March, 469
SAMSON, PAUL C. See **BYRON, FRANCIS X.**
SAMUEL, ERIC: Myocardial infarction and cardiac aneurysm: their roentgen diagnosis (ab), March, 454
SANCHEZ-PEREZ, J. M. See **RANEY, RUPERT**
SANDRA, M. See **LOUBEYRE, J.**
SARCOIDOSIS
—Boeck's sarcoid; case complicated by pulmonary emphysema and cor pulmonale (ab), Irving Zimmerman and Norman Mann, June, 900
—differential diagnosis; 10 cases with ocular involvement (ab), Byron L. Gifford and Arlington C. Krause, June, 900
—six cases (ab), Irwin L. Norman and William Shoemaker, May, 796
SARCOMA
See also Bones, tumors; Uterus, tumors; etc.
—congenital sarcoma (ab), M. L. Dreyfuss, April, 631
angiosarcoma
—of sternum (ab), Alois Pollak, March, 472
fibrosarcoma
—sarcoma in irradiated mandible; case (ab), Sigvard Kaae and Mogens Glahn, May, 801
lymphosarcoma
—of duodenum; case; review of literature (ab), Murray M. Copeland and D. James Greiner, March, 460
—of gastro-intestinal tract; 21 cases (ab), M. A. Spellberg and Simon Zivin, Feb., 298
myosarcoma
—rhabdomyosarcoma: its dissemination and response to radiation (ab), Jeffery P. Moore, April, 631
—roentgen study of muscle tumors primary in lung, Robert S. Sherman and Bert H. Malone, April, 507
SCALP. See Ringworm
SCANNELL, J. GORDON: Bronchographic anatomy of the lungs (ab), March, 446
SCAPHOID BONE, CARPAL
—fractures of distal end of radius complicated by fractures of carpal scaphoid (ab), O. D. Chrisman and J. H. Shortell, June, 914
SCHAFFNER, FENTON, FRIEDELL, MORRIS T., PICKETT, WILLIAM J., and HUMMON, IRVIN F., Jr.: Radioactive isotopes in the study of peripheral vascular disease. II. Method of evaluation of various forms of treatment (ab), May, 799
——See **FRIEDELL, MORRIS T.**
SCHANHER, PAUL W., Jr., and HODGE, G. B.: Mediastinal lipoma with inclusion of remnants of thymus gland (ab), Feb., 297
SCHARNAGEL, ISABEL M., and PACK, GEORGE T.: Multiple basal cell epitheliomas in a five year old child (ab), April, 636
SCHEFFEY, LEWIS C.: Contrast methods in the management of uterine malignancy (ab), May, 794
Diagnosis and management of fundal carcinoma (ab), Jan., 151
SCHENCK, H. C. See **BURKE, M. H.**
SCHENCK, SAMUEL G.: Hidradenitis suppurativa axillaris. An analysis of 54 cases treated with roentgen rays, Jan., 74
SCHINDLER, RUDOLF. See **MOURAO, MILTON M.**
SCHLESINGER, MONROE J. See **BREAN, HENRY P.**
SCHMIDT, CHARLOTTE. See **WERNER, SIDNEY C.**
SCHMITT, G. H.: Symmetrical transformation zones (so-called Milkman's disease) (ab), April, 628
SCHNEIDER, LOUIS: Pulmonary hazard of the ingestion of mineral oil in the apparently healthy adult. A clinico-roentgenologic study, with a report of 5 cases (ab), Feb., 296
——See **SCHNEIERSON, SAMUEL J.**
SCHNEIDER, MARTIN, and KLEIN, C. P.: Blast injury of the lungs, with report of a case occurring in peace time, April, 548
SCHNEIDERMAN, CLARENCE: Regression of diverticula following relief of vesical neck obstruction (ab), March, 469
SCHNEIERSON, SAMUEL J., and SCHNEIDER, LOUIS: Lipoid granulomatosis (xanthomatosis) with marked pulmonary fibrosis and cor pulmonale as outstanding manifestations (ab), March, 450
SCHOENAU, CARL W. See **HOTCHKISS, ROBERT S.**
SCHORK, P. K. See **CRONKITE, EUGENE P.**
SCHORR, S. See **DRUCKMANN, A.**
SCHUKNECHT, HAROLD F., and LINDSAY, JOHN R.: Benign cysts of the paranasal sinuses (ab), May, 768
SCHULZ, MILFORD D. See **SHULL, HARRISON J.**
SCHWANNOMA. See Tumors, neurinoma
SCHWARTZ, JACK W., and IREY, NELSON S.: Post-caval ureter. Report of a case (ab), May, 790
SCIATICA
new method of demonstration of ligamentous changes in lumbago and sciatica (ab), F. K. Fischer, March, 463
SCIENTIFIC PAPERS
—contra longiloquia (ed), Richard M. Hewitt, April, 602
SCLEROMA. See Rhinoscleroma
SCLEROSIS
See also Osteosclerosis
—tuberous sclerosis in 3 siblings (ab), Paul W. Miles and Joseph M. Dixon, March, 446
SCOLIOSIS. See Spine
SCOTT, EARL S. See **RITTER, JOSEPH A.**
SCOTT, KENNETH G., AXELROD, DOROTHY, CROWLEY, JOSEPHINE, and HAMILTON, JOSEPH G.: Deposition and fate of plutonium, uranium, and their fission products inhaled as aerosols by rats and man (ab), June, 925
SCOTT, MICHAEL: Case of amyotonia congenita associated with occlusion of the sagittal sinus and bilateral subdural hygroma. Demonstration of occlusion by diotrast sinography (ab), Jan., 130
SCOTT, RONALD B.: Place of radiotherapy in the treatment of chronic lymphoid leukaemia (ab), June, 923
SCOTT, WENDELL G., and MOORE, SHERWOOD: Development of the tautograph and the advantages of automatization in cardiovascular angiography (ab), June, 918
SCOVILLE, WILLIAM B. See **WHITCOMB, BENJAMIN B.**
SCRUGGS, JOE B., Jr. See **MESCHAN, ISADORE**
SEDLEZKY, I. See **ABRAMS, M.**
SELIGMAN, ARNOLD M., RUTENBURG, ALEXANDER M., and FRIEDMAN, ORRIE M.: Distribution studies in mice following the intravenous injection of diethyl β-iodoethyl amine hydrochloride prepared with radioactive iodine (ab), Jan., 156
SESAMOID BONE
—sesamoid bones of hands and feet (ab), Charles A. Hubay, March, 467
SHAFER, JUNE C., BRAESTRUP, CARL B., and FISHER, JEROME K.: Relation of exit dose and other dosage factors to roentgen injuries (ab), April, 635
SHANNON, C. E. G. See **WALDMAN, JOSEPH**
SHAPIRO, IRVING J. See **KUNDSTADTER, RALPH H.**
SHARLIN, HERBERT S. See **GOTTLIEB, CHARLES**
SHAUFFER, IRVING A. See **RITVO, MAX**
SHAW, ROBERT R.: Thoracic complications of amebiasis (ab), May, 774
SHEA, PATRICK C. See **COOPER, F. W.**
SHEINMEL, ARCHIE, ROSWIT, BERNARD, and LAWRENCE, LEWIS R.: Hodgkin's disease of the lung: roentgen appearance and therapeutic management, Feb., 165
——See **STEIN, JOSEPH**
SHEPARD, R. M. See **DiLEO, J. L.**
SHERMAN, ROBERT S., and MALONE, BERT H.: A roentgen study of muscle tumors primary in the lung, April, 507
SHERWOOD, PAUL M. See **CAPLAN, MAX**
SHOEMAKER, WILLIAM. See **NORMAN, IRWIN L.**
SHORTELL, J. H. See **CHRISMAN, O. D.**
SHOULDER
—calcium deposits in the vicinity of the shoulder and other joints (ab), J. Albert Key, May, 784
—subacromial bursitis: classification and an evaluation of results of roentgen therapy (ab), A. C. McCurrach, et al, June, 924
—treatment of bursitis and peritendonitis calcarea by roentgen therapy (ab), Martin S. Abel and Irving I. Lomhoff, June, 924
—value of x-ray therapy in orthopedic cases (bursitis) (ab), Charles M. White and Charles Rombold, June, 924

SHULL, HARRISON J., SCHULZ, MILFORD D., and JONES, CHESTER M.: Roentgen examination of the defunctioned colon after ileostomy, with special reference to the safety and practical value of thorium dioxide as a contrast medium (ab), May, 781
SICKLE CELLS. See Anemia, sickle-cell
SIDEROSIS
See also Hemosiderosis
—industrial siderosis (ab), A. T. Doig, June, 902
SIEVE METHOD. See Cancer, radiotherapy
SIGMOID
See also Intestines, volvulus
—diagnostic difficulties in rectosigmoid lesions (ab), Vernon B. Blaha and Harry C. Saltzstein, May, 782
—mobility of the rectosigmoid: a new diagnostic sign, George Levene and Ernest A. Bragg, Jr., May, 717
SILICOSIS. See Pneumoconiosis
SILVERMAN, FREDERIC N.: Treatment of leukemia and allied disorders with folic acid antagonists; effect of aminopterin on skeletal lesions, May, 665
SILVIS, RICHARD S.: Carcinoma of the ascending colon. Report of a case (ab), June, 908
SIMKIN, BENJAMIN. See **PRINZMETAL, MYRON**
SIMMONS, MARVIN W., and ARIEL, IRVING M.: Carcinoma of the nasopharynx. Report of 150 cases (ab), May, 794
SIMON, STANLEY D.: Aseptic necrosis of femoral head following roentgen therapy for carcinoma of the cervix uteri (ab), March, 476
SIMONETTI, CASIMIRO, and TOMISELLI, MAINARDO: Hysterosalpingography with 70 per cent joduron (ab), May, 789
SIMPSON, JAMES R. See **ROSENBERG, LEE S.**
SIMPSON, N. R. W., and STEVENSON, C. J.: An analysis of 200 cases of ankylosing spondylitis (ab), Jan., 144
SINOGRAPHY. See Brain, roentgenography
SINTON, ELEANOR. See **INGRAHAM, C. B.**
SINUS TRACT
—carcinoma developing in chronic draining cutaneous sinuses and fistulas (ab), A. K. McAnally and Malcolm B. Dockerty, Jan., 143
—demonstration of sinus tracts, fisultas, and infected cavities by lipiodol (ab), James M. Dell, Jr., Jan., 150
SINUSES, PARANASAL
—benign cysts (ab), Harold F. Schuknecht and John R. Lindsay, May, 768
—malignant lesions of nasal fossae and sinuses: diagnosis and treatment (ab), Austin T. Smith and Theodore P. Eberhard, May, 794
—syndrome of sinus and bronchial disease in children: its treatment by detergent antibiotics (ab), Emilio Alemán, April, 614
SIPE, C. R. See **CRONKITE, EUGENE P.**
SIRIS, IRWIN E.: Malignant tumors of the small intestine (ab), April, 621
SITUS INVERSUS. See Viscera
SJÖGREN'S SYNDROME. See Salivary Glands
SJÖQVIST, OLOF, af BJÖRKESTEN, G., and FERNSTRÖM, ULF: Diagnosis of intracerebral hematomas following frontal lobotomy (ab), June, 895
SJÖSTRAND, TORGNY. See **KJELLBERG, SVEN R.**
SKAGGS, L. S. See **QUASTLER, H.**
SKANSE, BENGT N. See **RAWSON, RULON W.**
SKAPINKER, SAMUEL: Intestinal obstruction due to ascaris (ab), June, 908
SKIN
—lead-containing clay for shielding in roentgen ray treatment of skin (ab), Robert Kaldeck, May, 792
—Loeffler's syndrome with concomitant non-specific maculopapular rash; case (ab), I. Louis Hoffman and George S. Huard, June, 903
cancer
—carcinoma developing in chronic draining cutaneous sinuses and fistulas (ab), A. K. McAnally and Malcolm B. Dockerty, Jan., 143
—multiple basal-cell epitheliomas in a 5-year-old child (ab), Isabel M. Scharnagel and George T. Pack, April, 636
—roentgen treatment of cutaneous carcinoma involving cartilage (ab), Leo M. Levi, Feb., 307
—routine management of carcinoma (ab), Herbert L. Traenkle, June, 919
—study of failures in contact roentgen therapy (ab), P. Chatton, May, 792
SKINNER, I. C.: A simple method of applying vaginal radium (ab), March, 472
SKULL. See Cranium
SLOAN, ROBERT D. See **COOLEY, ROBERT N.**
——See **ROACH, JOHN F.**
SMITH, AUSTIN T., and EBERHARD, THEODORE P.: Malignant lesions of nasal fossae and sinuses. Diagnosis and treatment (ab), May, 794
SMITH, ERNEST T. See **ANDERSON, M. X.**
SMITH, FRANKLIN R., and BOYDEN, EDWARD A.: An analysis of variations of the segmental bronchi of the right lower lobe of fifty injected lungs (ab), March, 446
——See **BERG, ROGER M.**
SMITH, HOWARD E.: Mass photofluorography in Texas (ab), April, 616
SMITH, K. SHIRLEY, and WOOD, FRANKLIN, G.: Radiokymography in patent ductus arteriosus (ab), June, 905
SMITH, LESTER A. See **KNEIDEL, JOHN H.**
SMITHERS, D. W. See **STEED, P. R.**
SMYRNIOTIS, P. C.: Value of appendiceal pain in the roentgen diagnosis of chronic appendicitis (ab), June, 909
SNAPE, WILLIAM J. See **KERN, RICHARD A.**
SNEDECOR, SPENCER T., and WILSON, HARRISON B.: Some obstetrical injuries to the long bones (ab), March, 464
SNODDY, WILLIAM T. See **HALPERT, BÉLA**
SNOW, S. R., Jr. See **KARR, JOHN W.**
SNYDER, R. H., and KISIELESKI, W. E.: The relative biological effectiveness of beta and roentgen radiation as shown by the radiotoxicity of Na^{24} for mice, May, 743
SODIUM
radioactive. See Radioactivity
SOLOFF, LOUIS A. See **KERN, RICHARD A.**
SORNBERGER, C. FRANKLIN. See **HARE, HUGH F.**
SOSMAN, MERRILL C.: Cushing's disease—pituitary basophilism. Caldwell Lecture, 1947 (ab), June, 920
——See **BREAN, HENRY P.**
SPASTICITY
—distention of the subarachnoid space with cerebrospinal fluid in infants; enlargement of the head and spasticity; surgical correction (ab), Charles Bagley, Jr., et al, April, 613
SPEAR, F. G. See **GILMOUR, MARY D.**
SPEARS, GEORGE N., and OWEN, J. T.: Etiology of trochanteric fractures of the femur (ab), June, 915
SPEERT, HAROLD, and PEIGHTAL, THOMAS C.: Malignant tumors of the uterine fundus subsequent to irradiation for benign pelvic conditions (ab), Jan., 151
SPELLBERG, M. A., and ZIVIN, SIMON: Lymphosarcoma of the gastrointestinal tract, with a report of twenty-one cases (ab), Feb., 298
SPHENOID BONE
—pulsating exophthalmos due to defective development of the sphenoid bone (ab), E. Graeme Robertson, June, 897
SPINA BIFIDA
—congenital malformation of vertebrae (hemivertebrae) with aplasia of corresponding ribs, associated with a lateral meningomyelocele; case (ab), I. Ralph Goldman, Jan., 144
SPINAL CANAL ROENTGENOGRAPHY
See also Spinal Cord; Spine, intervertebral disks
—contrast myelography past and present. Carman lecture, John D. Camp, April, 477
—diagnosis of spinal meningiomas and schwannomas by myelography (ab), Ernest H. Wood, Jr., April, 628
—roentgen diagnosis of herniation of brain into spinal canal (Arnold-Chiari deformity) by pantopaque myelography; case diagnosed preoperatively, Julian R. Lewin, Henry T. Wycis, and Barton R. Young, April, 591
SPINAL CORD
—compression fractures of spine complicated by injury to spinal cord (ab), John R. Norcross, Feb., 301
—diastematomyelia: transfixation of the cord or cauda equina with congenital anomalies of the spine, Edward B. D. Neuhauser, Martin H. Wittenborg, and Klaus Dehlinger, May, 659
—differential diagnosis of lesions (ab), J. Lawrence Pool, March, 470
—spondylitis, pathological ossification, and calcification associated with spinal cord injury (ab), Daniel J. Abramson and Samuel Kamberg, March, 465
tumors
—diagnosis of intraspinal hemangiomas by myelography, Edwin C. Ernst, Jr., and Norman Heilbrun, March, 417
—pial-medullary angiomas: clinicopathologic features and treatment (ab), Robert C. Bassett, et al, May, 788
SPINAL PUNCTURE
—infected intervertebral disk after lumbar puncture (ab), L. L. Bromley, et al, Jan., 145
SPINE
See also Spinal Canal Roentgenography
—constriction of intervertebral foramen: a cause of nerve root pressure (ab), Lee A. Hadley, June, 912
—extradural cyst (ab), Henry G. Decker and Kenneth E. Livingston, April, 628
—osteitis (ab), Charles D. Donahue, Jan., 144
—pathology of neural-arch defects: a dissection study (ab), Maurice B. Roche, June, 912
—pseudarthrosis: diagnosis and repair (ab), Edgar L. Ralston and Walter A. L. Thompson, June, 913
—spondylitis, pathological ossification, and calcification associated with spinal cord injury (ab), Daniel J. Abramson and Samuel Kamberg, March, 465
abnormalities
—congenital malformation of vertebrae (hemivertebrae) with aplasia of corresponding ribs, associated with a lateral meningomyelocele; case (ab), I. Ralph Goldman, Jan., 144
—diastematomyelia: transfixation of the cord or cauda equina with congenital anomalies of the spine, Edward B. D. Neuhauser, Martin H. Wittenborg, and Klaus Dehlinger, May, 659
—significance of congenital lumbo-sacral abnormalities (ab), H. W. Gillespie, April, 627
abscess. See Spine, tuberculosis
arthritis
—ankylosing spondylitis; analysis of 200 cases (ab), N. R. W. Simpson and C. J. Stevenson, Jan., 144
—effect of roentgen therapy on urinary 17-ketosteroid excretion in ankylosing spondylarthritis (ab), Roland A. Davison, et al, Jan., 153

SPINE, arthritis—*cont.*
—rheumatoid (Marie-Strümpell) spondylitis: technic of examination and importance of the costal joints (ab), A. Justin Williams, March, 465
—rheumatoid spondylitis: its early diagnostic features and management (ab), Richard Z. Query, Jr., April, 627
—rheumatoid spondylitis: observations on the incidence and response to therapy among veterans of the recent war (ab), Elam C. Toone, Jr., March, 465
—rheumatoid spondylitis: roentgen therapy (ab), Nathan M. Spishakoff and B. V. A. Low-Beer, Jan., 153
—treatment of ankylosing spondylitis and osteoarthritis (ab), F. Duval, Feb., 309
—value of x-ray therapy in orthopedic cases (ab), Charles M. White and Charles Rombold, June, 924
curvature
—mechanism of structural changes in scoliosis; preliminary report (ab), Alvin M. Arkin, Feb., 302
—scoliosis with paraplegia (ab), K. G. McKenzie and F. P. Dewar, April, 626
fractures
—compression fractures, complicated by injury to spinal cord (ab), John R. Norcross, Feb., 301
—convulsive fractures of dorsal spine following electric-shock therapy, Isadore Meschan, Joe B. Scruggs, Jr., and Joseph D. Calhoun, Feb., 180
intervertebral disks
—disk injury: analysis of 113 industrial cases (ab), Henry C. Marble and William A. Bishop, Jan., 144
—infected disk after lumbar puncture (ab), L. L. Bromley et al, Jan., 145
—myelogram following operation for herniated disk (ab), Folke Knutsson, June, 913
—radiographic evidence of intermittent protrusion (ab), C. C. Chatterton, June, 913
—results of operations for lumbar protruded disk (ab), John Raaf and George Berglund, Feb., 302
syphilis
—radiologic aspects; 3 cases (ab), Aubry, et al, March, 466
tuberculosis
—spontaneous sacro-iliac obliteration in patients with tuberculosis (ab), Alvin S. Isaacson and Walter M. Whitehouse, March, 466
—unilateral tuberculous abscess of the thoracic spine with roentgen findings of a dumb-bell neurofibroma, John H. Kneidel, Lester A. Smith, and Robert E. Bishop, Jan., 78
tumors
—neurofibroma: benign intraspinal-intrathoracic "hour-glass" tumor with paraplegia (ab), Eben Alexander, Jr., and Robert M. Janes, Jan., 144
SPISHAKOFF, NATHAN M., and LOW-BEER, B. V. A.: Roentgen therapy of rheumatoid spondylitis (ab), Jan., 153
SPLEEN
—studies with colloids containing radioisotopes of yttrium, zirconium, columbium, and lanthanum. II. The controlled selective localization of radioisotopes of yttrium, zirconium, and columbium in the bone marrow, liver, and spleen (ab), Ernest L. Dobson, et al, Feb., 311
SPONDYLITIS. See Spine
SPRITZLER, RAMON J. See **PRINZMETAL, MYRON**
SPRUE
—small intestinal pattern in sprue and similar deficiency diseases (ab), Alice Ettinger, April, 622
SQUAMOSITIS. See Temporal Bone
STADERMAN, ALBERT H., and BOOTH, ROBERT E.: Volvulus of the sigmoid colon. Report of a case (ab), Jan., 141
STANGL, ANNI: Diagnosis of bronchial carcinoma by means of tomography (ab), June, 899
STARLING'S LAW. See Heart, roentgenography
STEARNS, DAVID B. See **ABRAMS, M.**
STEATORRHEA
—masked steatorrhea revealed by pseudofractures (Looser's zones) with some observations on calcium excretion in convalescence (ab), J. R. Nassim and N. H. Martin, June, 912
STEED, P. R., O'CONNOR, A. D., LAMERTON, L. F., WINTERNITZ J. G., MAYNEORD, W. V., and SMITHERS, D. W.: Symposium on small field therapy for deep-seated tumors (ab), March, 470
STEIN, JOSEPH, and SHEINMEL, ARCHIE: Cavitary disease of the lungs (due to less frequent etiological factors), Feb., 219
STEIN, SAMUEL C. See **COCHRANE, ARCHIBALD L.**
STEINBERG, ISRAEL. See **DOTTER, CHARLES T.**
STEINER, R. See **GOODWIN, J. F.**
STEINER, R. E. See **DAVIES, C. E.**
STEINHAUSEN, T. B. See **KARR, JOHN W.**
STEPHANIDES, T. See **LYDON, F. L.**
STERNUM
—angiosarcoma (ab), Alois Pollak, March, 472
STEROIDS. See Urine
STEVENS, CHARLES D., LEE, ALICE, STEWART, PAUL H., QUINLIN, PATRICIA M., and GILSON, PAUL R.: Distribution of radioactivity in tumor-bearing mice after injection of radioactive iodinated trypan blue (ab), Feb., 311
STEVENSON, C. J. See **SIMPSON, N. R. W.**
STEVENSON, CHARLES S.: X-ray visualization of the placenta: experiences with soft-tissue and cystographic techniques in the diagnosis of placenta previa (ab), June, 916
STEVENSON, THOMAS W.: Surgical treatment of x-ray burns (ab), Feb., 312
STEVENSON, VERNON. See **HICKEN, N. FREDERICK**
STEWART, ALICE, and HUGHES, J. P. W.: Tuberculosis in industry: an epidemiological study. Preliminary report (ab), April, 615
STEWART, CHARLES M.: True right supernumerary kidney diagnosed preoperatively (ab), Jan., 147
STEWART, PAUL H. See **STEVENS, CHARLES D.**
STILSON, WALTER L., and NEUFELD, OTTO J.: Spontaneous pneumoperitoneum (ab), March, 462
STIVELMAN, BARNET P., and KAVEE, JULIUS: Treatment of acute putrid lung abscess with penicillin and sulfadiazine (ab), Jan., 134
STOCKLEN, JOSEPH B. See **CUTTER, HAROLD C.**
STOMACH
See also Gastro-Intestinal Tract; Pylorus
—downward displacement of the gastric cardia, Fred J. Hodges, Feb., 194
—gastroscopic perforation of esophagus and stomach; 3 cases (ab), Leonard M. Asher and Sidney Cohen, May, 780
—obstruction of the gastro-esophageal junction (ab), P. R. Allison, June, 907
—vascularization of human stomach; preliminary note on shunting effect of trauma (ab), A. E. Barclay and F. H. Bentley, Jan., 139
cancer
—consideration of certain sources of error in positive diagnosis of carcinoma (ab), Eddy D. Palmer, June, 908
—detection of carcinoma by photofluorographic methods. Introduction. Equipment design (ab), John F. Roach, et al, Jan., 140
—early diagnosis of carcinoma (ab), Norman Bolker, April, 620
—hiatus hernia and carcinoma of stomach and esophagus (ab), Irving B. Brick, June, 908
—ineffectiveness of present-day radiology in diagnosis of carcinoma of the cardiac end of the stomach, with suggestions for improvement (ab), V. J. Kinsella, April, 621
—mass roentgen survey of gastro-intestinal tract to detect cancer of stomach (ab), Sherwood Moore, March, 458
—radiologic studies of abdominal aorta in individuals over 50 as an aid to the differential diagnosis between benign and malignant ulceration of stomach (ab), A. Elkeles, April, 621
—unusual role of roentgenology in diagnosis; case (ab) Paterno S. Chikiamco, April, 621
foreign bodies
—trichobezoar (ab), A. M. Nussey and A. R. Leask, March, 460
hernia. See Hernia, diaphragmatic
inflammation
—pancreatic lithiasis and gastritis (cases with gastroscopic observations) (ab), Milton M. Mourao and Rudolf Schindler, June, 910
—radiographic manifestation of hyperplastic gastritis (ab), J. Bücker, April, 621
mucosa
—clinical aspects of prolapsed mucosa (ab), Francis W. Wilson and W. H. Granger, March, 459
—prolapse of mucosa into duodenum; case report and analysis of reported cases (ab), J. L. DiLeo, et al, Feb., 299
—prolapse of redundant mucosa (ab), Arthur M. Cove and Wilfred C. Curphey, Jan., 139
—roentgen diagnosis of prolapsed mucosa (ab), Chapin Hawley, et al, May, 780
roentgenography
—examination in supine position (ab), Enrico Benassi, March, 458
—fluid in the lesser omental sac as a cause of extragastric pressure defect (ab), Sol Glotzer, June, 908
—gastric rugae (ab), R. P. O'Bannon (ab), March, 458
—study of the paradiaphragmatic esophagus and of the cardia (ab), Albert Jutras, et al, June, 907
—use of CO_2 and air as antispasmodics (ab), Paul Cave, March, 457
tumors
—benign non-epithelial tumors (ab), Jacob Rabinovitch, et al, March, 460
—carcinoid tumor (argentaffinoma) (ab), C. Wilmer Wirts and Robert L. Breckenridge, March, 460
—multiple lipomas (ab), N. W. Fawcett, et al, March, 460
STONE, JACOB. See **MASTER, ARTHUR M.**
STONE, JOSEPH R. See **ELCONIN, DAVID V.**
STONE, R. S. See **JACOBSON, LEON O.**
STOUT, ARTHUR P., HUMPHREYS, GEORGE H., II, and ROTTENBERG, LOUIS A.: A case of carcinosarcoma of the esophagus (ab), March, 458
STREPTOMYCIN. See Intestines; Trachea; Tuberculosis, Pulmonary
STRODE, J. E.: Cystic disease of the lung (ab), May, 770
STUART, F. G.: The tumor clinic as a study group, Feb., 263
SUBARACHNOID SPACE. See Meninges
SUDECK'S ATROPHY. See Bones
SUGAR, OSCAR, HOLDEN, LAWRENCE B., and POWELL, CHESTER B.: Vertebral angiography (ab), Jan., 137
SULFADIAZINE. See Lungs
SULFUR
radioactive. See Radioactivity
SUSSMAN, MARCY L. See **NEUHOF, HAROLD**
SUSSMAN, WALTER. See **COLCHER, A. E.**

SUTRO, CHARLES J., and GLADSTONE, HERMAN: Tuberculosis of the bones of the hip joint (ab), March, 466
SUZMAN, S. See **BAKER, CHARLES**
SWARTZ, MELVILLE J.: Multiple renal calculi demonstrating stone level formation (ab), April, 628
SWEAT GLANDS. See Hidradenitis; Hyperhidrosis
SWEET, RICHARD H.: Intrathoracic goiter located in the posterior mediastinum (ab), June, 903
SWENSON, PAUL C.: Evaluation of radiographic pelvimetric technics (ab), Feb., 304
—— and WILNER, DANIEL: Unfused ossification centers associated with pain in the adult (ab), Feb., 300
SWINTON, NEIL W., HARE, HUGH F., and MEISSNER, WILLIAM A.: Diagnosis of cancer of the large bowel (ab), May, 782
SWYER, ALFRED J. See **RABINOVITCH, JACOB**
SYKES, EDWIN M., Jr. See **McINTIRE, FLOYD T.**
SYMPATHOBLASTOMA. See Tumors, sympathoblastoma
SYNOVIAL MEMBRANE
—pigmented villonodular synovitis, Maurice M. Greenfield and K. M. Wallace, March, 350
—value of x-ray therapy in orthopedic cases (synovitis) (ab), Charles M. White and Charles Rombold, June, 924
SYPHILIS
—See also Bones; Lungs; Spine
—cancer, gumma and tuberculosis of the forearm (ab), Nelson C. Jefferson, Jan., 146
—Parrot's syphilitic pseudoparalysis (ab), Otto Fliegel, March, 463
SZELLŐ, F.: Roentgenography of vaginal cysts (ab), March, 469

T

TALBOT, HERBERT S., and BUNTS, R. CARL: Late renal changes in paraplegia: hydronephrosis due to vesicoureteral reflux (ab), April, 629
TALLANT, EDWARD J., O'NEILL, HUGH A., URBACH, FREDERICK, and PRICE, ALISON H.: Gastro-intestinal food hypersensitivity: roentgenographic demonstration (ab), March, 459
TALUS
—unusual lesion occurring in leprosy, Paul T. Erickson and A. Mayoral, March, 357
TANCA MARÉNGO, J., and MATA MARTINEZ, JULIO: Atelectasis of the right upper lobe (ab), Jan., 136
TAPLIN, GEORGE V. See **ADOLPH, WILLIAM**
TAUSSIG, HELEN B., and BING, RICHARD J.: Complete transposition of the aorta and a levoposition of the pulmonary artery. Clinical, physiological, and pathological findings (ab), March, 455
TAUTOGRAPH. See Roentgen Rays, apparatus
TAYLOR, ASHTON B., and BRINEY, ALLAN K.: Observations on primary coccidioidomycosis (ab), June, 901
TAYLOR, E. STEWART. See **INGRAHAM, C. B.**
TEASLEY, GERALD H.: Cystitis emphysematosa: case report with a review of literature (ab), June, 918
TEMPORAL BONE
—squamositis, mastoiditis, and squamomastoiditis (ab), Dominick A. DeLisa, April, 613
TEPLICK, J. GEORGE, and DORSEY, PHILIP: Roentgen findings in intracranial mass lesions (ab), May, 767
TERRACOL, JEAN, and LAMARQUE, PAUL: A technic for contact radiotherapy in laryngeal cancer (ab), March, 471
TESTES
See also Castration
—effect of neutron radiation on human testes; case (ab), John N. Robinson and Earl T. Engle, April, 637
TETRAETHYLAMMONIUM CHLORIDE
—effects on human gastro-intestinal tract (ab), Rosalie B. Neligh, et al, Jan., 139
TETRALOGY OF FALLOT. See Heart, abnormalities
TEYSSIER. See **PRUVOST, P.**
THACKRAY, A. C. See **GRIFFITHS, I. H.**
THEILKÄS, ERNST: Tomographic demonstration of broncholiths (ab), Feb., 297
Unusual rib lesion (monostotic fibrous dysplasia) (ab), March, 466
THEODOS, PETER A. See **GORDON, BURGESS**
THOMAN, WILLIAM S., and MURPHY, ROBERT E.: Infantile cortical hyperostoses. Review of cases with a case report, May, 735
THOMASON, JAMES R., and MORETZ, WILLIAM H.: Right paraduodenal hernia, with report of a case (ab), May, 780
THOMPSON, E. A. See **QUASTLER, H.**
THOMPSON, EDGAR A. See **WEENS, H. STEPHEN**
THOMPSON, M. D. See **FRAZER, A. C.**
THOMPSON, RAYMOND K. See **BAGLEY, CHARLES Jr.**
THOMPSON, WALTER A. L. See **RALSTON, EDGAR L.**
THOMS, HERBERT, and CHENEY, CHARLES B.: Outlet pelvimetry. Results in measuring the symphysis-biparietal and sacral-biparietal diameters in 145 primiparous women (ab), June, 916
THORACOTOMY. See Lungs
THORAX
See also Heart; Lungs; Mediastinum; etc.
—intrathoracic gastroenteric cysts (ab), Hugh Linder, May, 776
roentgenography
—normal roentgenogram in infants and children (ab), John R. Hodgson, April, 614
—preoperative scout film (ab), Franklin B. Wilkins, et al, May, 770
—pulmonary air meniscus, H. Stephen Weens and Edgar A. Thompson, May, 700
—value of lateral view in tomography (ab), P. Chatton, et al, March, 447
tumors
—intrathoracic hour-glass ganglioneuroma; case (ab), H. Clarkson Meredith, Jr., June, 899
—intrathoracic sympathoblastoma (ab), Milton R. Louria June, 899
—solitary tumors: differential diagnosis in 50 proved cases (ab), Robert K. Arbuckle, June, 898
THORIUM DIOXIDE
—roentgen examination of the defunctioned colon after ileostomy, with special reference to the safety and practical value of thorium dioxide as a contrast medium (ab), Harrison J. Shull, et al, May, 781
THOYER-ROZAT, P., and PIEQUET, J.: Angiocardiography, its clinical and radiologic interest (ab), June, 905
THRASH, J. A. See **BURKE, M. H.**
THREEFOOT, SAM A., BURCH, GEORGE, and REASER, PAUL: The biological decay periods of sodium in normal man, in patients with congestive heart failure, and in patients with the nephrotic syndrome as determined by Na^{22} as the tracer (ab), Jan., 154
——See **BURCH, GEORGE E.**
THRIFT, GEORGE N.: Radium therapy for lymphoid hyperplasia of the nasopharynx (ab), April, 633
THROMBOENDARTERITIS
—with multiple mycotic aneurysms of branches of pulmonary artery (ab), Conrad L. Pirani, et al, March, 453
THROMBOSIS
—arteriography in cerebral vascular accidents (ab), I. S. Wechsler and S. W. Gross, May, 767
—deep vein thrombosis in newborn infant (ab), Maurice J. Keller, May, 788
—roentgen examination in acute thrombosis, J. Frimann-Dahl, March, 408
THYMUS
—mediastinal lipoma with inclusion of remnants of thymus gland (ab), Paul W. Schanher, Jr., and G. B. Hodge, Feb., 297
—thymectomy in treatment of myasthenia gravis; 32 cases (ab), L. M. Eaton, et al, April, 617
THYROID
See also Goiter
—pericardial effusion: a constant, early and major factor in the cardiac syndrome of hypothyroidism (myxedema heart) (ab), Richard A. Kern, et al, May, 777
—radioactive iodine: its use in studying certain functions of normal and neoplastic thyroid tissues (ab), Rulon W. Rawson, et al, Feb., 310
—radioiodine in the study and treatment of thyroid disease: a review (ab), Mavis P. Kelsey, et al, Jan., 154
—subacute (pseudotuberculous, giant-cell) thyroiditis and its treatment (ab), John D. Osmond, Jr., and U. V. Portmann, May, 798
—thyroid collection of radioactive iodide and serum protein-bound iodine concentration in senescence, in hypothyroidism and in hypopituitarism (ab), Martha Perlmutter and D. S. Riggs, April, 638
—use of tracer doses of radioactive iodine, I^{131}, in the study of normal and disordered thyroid function in man (ab), Sidney C. Werner, et al, March, 474
cancer
—carcinoma in children: a 10-year follow-up, Hugh F. Hare and Richard V. Newcomb, March, 401
—radiosensitization of epitheliomas by amino-thiazol (ab), M. Dargent, et al, June, 921
TIBIA
—congenital posterior angulation (ab), Clarence H. Heyman and Charles H. Herndon, June, 915
—congenital pseudarthrosis of the tibia and its relation to fragilitas ossium; report of case and review of the literature (ab), F. Y. Khoo, May, 787
—intra-uterine fractures of tibia and fibula; case, with correction by osteotomy and plating (ab), George H. Dawson, Jr., March, 464
TILLIER. See **AUBRY**
TIN
—benign pneumoconiosis in a tin oxide recovery plant (ab) Harold C. Cutter, et al, April, 616
TITUS, PAUL. See **HARTMAN, J. WILEY, Jr.**
TOD, MARGARET C. See **GILMOUR, MARY D.**
TOMISELLI, MAINARDO. See **SIMONETTI, CASIMIRO**
TOMOGRAPHY. See Body Section Roentgenography
TONGUE
—cancer: review of 330 cases (ab), Melvin I. Gibbel, et al, April, 629
TONSILS
—lymphatic radiotherapy in infancy (ab), D. Cirillo, March, 473
—short-distance low-voltage roentgen therapy of inflammatory conditions (ab), Sven Hultberg, June, 924
TOONE, ELAM C., Jr.: Rheumatoid spondylitis: observations on the incidence and response to therapy among veterans of the recent war (ab), March, 465
——See **WINGFIELD, WILLIAM L.**
TORPIN, RICHARD, and ALLGOOD, J. L., Jr.: Simplified method of fetal roentgencephalometry: results checked in 482 cases (ab), Feb., 304

TOXOPLASMOSIS
—roentgen manifestations of acute and healed toxoplasmic encephalomyelitis, Wynton H. Carroll, April, 554
TRACHEA
—right aortic arch with a vascular ring constricting esophagus and trachea; 2 cases (ab), Béla Halpert, et al, April, 619
—tuberculosis of trachea and major bronchi; results of treatment with streptomycin (ab), Arthur M. Olsen and H. Corwin Hinshaw, June, 899
—tumorous growths in the pituitary and trachea following radiotoxic dosages of I^{131} (ab), Aubrey Gorbman, May, 801
TRAENKLE, HERBERT L.: Routine management of carcinoma of the skin and lips (ab), June, 919
TRAUMA
—vascularization of human stomach: preliminary note on shunting effect of trauma (ab), A. E. Barclay and F. H. Bentley, Jan., 139
TREVES, NORMAN: Castration as a therapeutic measure in cancer of the male breast (ab), Feb., 307
TRICHOBEZOAR. See Stomach
TRICUSPID VALVE. See Heart, abnormalities
TROCHANTER. See Femur
TROSTLER, I. S.: The medicolegal implications and status of fluoroscopy, Feb., 266
TROUNCE, J. R. See **BAKER, CHARLES**
TRUMP, J. G. See **HUNTER, F. T.**
TRYPAN BLUE. See Radioactivity
TUBERCULIN
—appraisal of the results of a six-year tuberculin and mass x-ray survey of the population of Asunción: based on more than 100,000 tests (ab), Angel R. Gines, et al, Jan., 133
—correlated study of tuberculin, histoplasmin and coccidioidin sensitivities with pulmonary calcification in the Rocky Mountain area (ab), W. K. Absher and F. Cline, Jr., May, 771
TUBERCULOMA. See Tumors, tuberculoma
TUBERCULOSIS. See Cranium; Forearm; Spine; Tuberculosis, Pulmonary; etc.
TUBERCULOSIS, PULMONARY
—co-existing disseminated coccidioidomycosis and tuberculosis; case (ab), George M. Firestone and Ellis S. Benson, March, 451
—cough fracture (in patients with pulmonary tuberculosis) (ab), Raymond C. Cohen, Jan., 146
—in industry: an epidemiological study; preliminary report (ab), Alice Stewart and J. P. W. Hughes, April, 615
—in the elderly (ab), Keith H. Hallam, Jan., 133
—incipient tuberculosis in persons over 40 (ab), Aaron D. Chaves, April, 614
—mediastinal defect with interpleural communication observed during pneumothorax therapy, case (ab), Isaac Epstein, Jan., 136
—platybasia associated with an unusual case of pulmonary tuberculosis; case with necropsy (ab), Isaac Epstein, April, 613
—pulmonary syphilis simulating extensive tuberculosis (ab), J. Loubeyre, et al, May, 774
—streptomycin-tuberculosis research project of the American Trudeau Society: a summary report (ab), H. McLeod Riggins and H. Corwin Hinshaw, Jan., 133
—tuberculosis and carcinoma of the lung (ab), Archibald C. Cohen, April, 615
—tuberculous spontaneous pneumothorax (ab), Bernard Hyde and Leroy Hyde, May, 773
mass roentgenologic surveys
—appraisal of the results of a six-year tuberculin and mass x-ray survey of the population of Asunción: based on more than 100,000 tests (ab), Angel R. Gines, et al, Jan., 133
—detection of various chest lesions (ab), Dan Morse, April, 616
—early diagnosis as means of control (ab), Eugene D. Rames, March, 451
—is tuberculosis contagious? Should radiophotography be obligatory? (ab), O. M. Mistal, Jan., 133
—mass photofluorography in Texas (ab), Howard E. Smith, April, 616
—organization of a photoroentgen survey (with a technical supplement) (ab), H. Birkhäuser, April, 616
—routine photofluorography of chest (ab), John A. Mart, et al, March, 451
—tuberculosis studies in Muscogee County, Ga. I. Community-wide tuberculosis research (ab), George W. Comstock, Feb., 295
—tuberculosis studies in Muscogee County, Ga. II. X-ray findings in a community-wide survey and its coverage as determined by a population census (ab), M. H. Burke, et al, Feb., 295
—what does a roentgenographic survey teach the public? Including a comparison with other tuberculosis information polls (ab), Claudia B. Galiher and Jeanne E. Wright, April, 615
roentgenography. See also Tuberculosis, Pulmonary, mass roentgenologic surveys
—limitations of the role of the radiologist in diagnosis (ab), Keith H. Hallam, Jan., 132
—radiologic images which simulate tuberculosis in children (ab), José M. Mir, Feb., 295
—radiologic interpretation and pulmonary tuberculosis in the adult (ab), R. M. de Lambert, Jan., 132
—tomography as an aid in the diagnosis and treatment (ab), Alan King, Jan., 133
—tomography of larynx in disseminated pulmonary tuberculosis (ab), Max E. Galarza, June, 897
—value in prognosis of minimal tuberculosis (ab), Archibald L. Cochrane, et al, Jan., 133
—x-ray interpretation in childhood (ab), Colin Macdonald, Jan., 132
TUMORS
See also Cancer; Sarcoma; names of organs and regions
adenoma. See Bronchi, tumors; Parathyroid
angioma
—associated facial and intracranial hemangiomas (ab), Daniel F. Downing and Marshall B. Kreidberg, May, 767
—diagnosis of intraspinal hemangiomas by myelography, Edwin C. Ernst, Jr., and Norman Heilbrun, March, 417
—hemangioma of liver; case (ab), John G. Riddler and Gordon F. Madding, April, 631
—pial-medullary angiomas: clinicopathologic features and treatment (ab), Robert C. Bassett, et al, May, 788
—primary hemangioma of skull: a rare cranial tumor. Review of literature and report of case, with special reference to roentgen appearances (ab), B. D. Wyke, Feb., 293
—secondary hemangioma; case (ab), J. A. White, June, 911
chordoma
—roentgenologic study of 16 cases previously unreported, Ernest H. Wood, Jr., and George M. Himadi, May, 706
embryoma. See Kidneys, tumors
experimental
—distribution of radioactivity in tumor-bearing mice after injection of radioactive iodinated trypan blue (ab), Charles D. Stevens, et al, Feb., 311
—effect of local roentgen irradiation on the biological behavior of a transplantable mouse carcinoma. I. Increased frequency of pulmonary metastasis (ab), Henry S. Kaplan and Edwin D. Murphy, April, 637
—further studies on the relation between radiation effects, cell viability, and induced resistance to malignant growth. VI. Anomalous radiosensitivities of analogous mouse mammary adenocarcinomas, Anna Goldfeder, Jan., 93
ganglioneuroma
—intrathoracic hour-glass ganglioneuroma; case (ab), H. Clarkson Meredith, Jr., June, 899
giant-cell
—roentgen therapy of benign giant-cell tumor (ab), Franz Buschke and Simeon T. Cantril, Feb., 308
—treatment of giant-cell tumors of bone, with review of 25 cases (ab), T. M. Prossor, April, 632
glioma. See Retina, tumors
hamartoma
—of lung, Ernest A. Bragg, Jr., and George Levene, Feb., 227
hemangioma. See Tumors, angioma
lipoma
—mediastinal lipoma with inclusion of remnants of thymus gland (ab), Paul W. Schanher, Jr., and G. B. Hodge, Feb., 297
—multiple lipomas of stomach and duodenum (ab), N. W. Fawcett, et al, March, 460
mixed
—carcinosarcoma of esophagus; case (ab), Arthur P. Stout, et al, March, 458
myeloma
—osteoclastoma; 38 cases (ab), B. W. Windeyer and P. B. Woodyatt, April, 625
—treatment of osteoclastoma by radiation (ab), Frank Ellis, April 632
myoma
—leiomyoma of esophagus; case (ab), Alfred Hurwitz, Jan., 139
—roentgen study of muscle tumors primary in the lung, Robert S. Sherman and Bert H. Malone, April, 507
neurinoma
—diagnosis of spinal meningiomas and schwannomas by myelography (ab), Ernest H. Wood, Jr., April, 628
neuroblastoma
—roentgen therapy; 73 cases, Martin H. Wittenborg, May, 679
neurofibroma
—benign intraspinal-intrathoracic "hour-glass" tumor with paraplegia (ab), Eben Alexander, Jr., and Robert M. Janes, Jan., 144
—unilateral tuberculous abscess of the thoracic spine with roentgen findings of a dumb-bell neurofibroma, John H. Kneidel, Lester A. Smith, and Robert E. Bishop, Jan., 78
osteoclastoma. See Tumors, myeloma
osteoma
—osteoid osteoma; case with probable double lesion (ab), Paul W. Lapidus and Edward P. Salem, Feb., 303
plasmocytoma
—solitary plasmocytoma of bone (ab), H. Holden, Feb., 303
sympathoblastoma
—intrathoracic sympathoblastoma (ab), Milton R. Louria, June, 899
tuberculoma
—simulating cardiac aneurysm or localized pericardial effusion (ab), Kjell Liverud, June, 899
Wilms'. See Kidneys, tumors
TWINS
—thoracopagus twins: prenatal diagnosis, Charles M. Gray, H. G. Nix, and A. J. Wallace, March, 398

U

ULLRICH, F. W. See **CRONKITE, EUGENE P.**
ULNA
—bilateral os triangulare carpi; case (ab), G. Riva, March, 467
UNCAPHER, REX P. See **CLARK, WILLIAM G.**
URANIUM. See Radioactivity
URBACH, FREDERICK. See **TALLANT, EDWARD J.**
URETERS
—influence of uterus on ureter during pregnancy (ab), W. Rabinowitsch, Feb., 304
—late renal changes in paraplegia: hydronephrosis due to vesico-ureteral reflux (ab), Herbert S. Talbot and R. Carl Bunts, April, 629
—roentgen kymography in study of vesico-ureteral reflux (ab), Ayres de Souza, May, 790
—ureteral reflux in the normal child (ab), H. M. Gibson, June, 918
abnormalities
—fetal renal secretion and its significance in congenital deformities of the ureters and urethra (ab), Sven R. Kjellberg and Ulf Rudhe, Feb., 305
—post-caval ureter; case (ab), Jack W. Schwartz and Nelson S. Irey, May, 790
—retrocaval ureter (ab), Robert Lich, Jr., and Owsley Grant, June, 917
cancer
—metastatic carcinoma of ureter in carcinoma of the cervix (ab), Leo S. Drexler, Jan., 149
URETHRA
—fetal renal secretion and its significance in congenital deformities of the ureters and urethra (ab), Sven R. Kjellberg and Ulf Rudhe, Feb., 305
—radiologic aspect of utriculus prostaticus during urethrocystography (ab), Nils P. G. Edling, June, 918
cancer
—primary carcinoma of the male urethra (ab), José Miguel Gomez and Mauricio Firstater, March, 470
URINARY TRACT
See also Kidneys; Pyelography; Ureters; Urethra
—significance of symptoms and roentgen studies in disease (ab), D. Alan Sampson, March, 469
tumors
—radiologic diagnosis in infants and children, Meredith F. Campbell, May, 646
URINATION
—etiology of stress incontinence (ab), S. Richard Muellner, Jan., 148
—normal and abnormal micturition: study of bladder behavior by means of the fluoroscope (ab), S. Richard Muellner and Felix G. Fleischner, Jan., 148
URINE
—effect of roentgen therapy on urinary 17-ketosteroid excretion in ankylosing spondylarthritis (ab), Roland A. Davison, et al, Jan., 153
UROGRAPHY. See Pyelography
URTICARIA
—delayed pneumonia and urticaria following bronchography (ab), H. E. Bass, March, 448
UTERUS
—influence of uterus on ureter during pregnancy (ab), W. Rabinowitsch, Feb., 304
cancer
—cervical cancer: certain aspects of problem in Colorado (ab), C. B. Ingraham, et al, Feb., 307
—cervical cancer: current trends in diagnosis and treatment (ab), George L. Hoffman, Jr., May, 795
—cervical cancer: reactions to x-ray and radium in treatment (ab), Daniel G. Morton and John A. Kerner, March, 475
—cervical cancer: retroperitoneal lymph node dissection (ab), Joe V. Meigs, et al, May, 795
—cervical cancer: simple method of applying vaginal radium (ab), I. C. Skinner, March, 472
—cervical cancer: surgical intervention in recurrent and in "radioresistant" cancer (ab), J. Heyman and B. Belonoschkin, June, 922
—cervical cancer: symposium. Classification, Gerald A. Galvin, June, 815
—cervical cancer: symposium. Diagnosis of the early lesion, Gerald A. Galvin, June, 804
—cervical cancer: symposium. Dispersion, Erle Henriksen, June, 812
—cervical cancer: symposium. Introduction, A. N. Arneson, June, 803
—cervical cancer: symposium. Radium treatment of carcinoma, James F. Nolan, William E. Costolow, and Lucille DuSault, June, 821
—cervical cancer: symposium. Roentgen treatment, Gilbert H. Fletcher, June, 832
—cervical cancer: symposium. Surgical treatment, Erle Henriksen, June, 819
—cervical carcinoma (ab), Hugh F. Hare and C. Franklin Sornberger, April, 629
—cervical carcinoma (ab), Louis J. Levinson, et al, April, 630
—cervical carcinoma: aseptic necrosis of femoral head following roentgen therapy (ab), Stanley D. Simon, March, 476
—cervical carcinoma concomitant with pregnancy (ab), Melvin G. Sadugor, et al, April, 630
—cervical carcinoma: dosage distribution and dosage, W. J. Meredith, March, 386
—cervical carcinoma: influence of tumor histology, duration of symptoms and age of patient on radiocurability (ab) M. Gilmour, et al, Jan., 152
—cervical carcinoma metastatic to ureter (ab), Leo S. Drexler, Jan., 149
—cervical carcinoma: review of 100 cases (ab), Everett M. Baker, Jan., 151
—cervical carcinoma: study of 328 cases (ab), John W. Karr, et al, Feb., 307
—contrasting methods in management (ab), Lewis C. Scheffey, May, 794
—diagnosis and management of fundal carcinoma (ab), Lewis C. Scheffey, Jan., 151
—radium therapy of carcinoma of uterine body (ab), Herbert Deuel, Feb., 307
—treatment of carcinoma of body of uterus (ab), Braithwaite Rickford, Jan., 152
hemorrhage
—hysterogram in diagnosis of bleeding (ab), David J. Wexler, et al, May, 789
roentgenography. See also Uterus, hemorrhage
—diagnosis of adenomyosis (ab), Morris A. Goldberger, et al, Feb., 305
—hysterosalpingography with 70 per cent joduron (ab), Casimiro Simonetti and Mainardo Tomiselli, May, 789
—new contrast medium for hysterosalpingography (ab), Bryan Williams, June, 916
tumors
—malignant tumors of fundus subsequent to irradiation for benign pelvic conditions (ab), Harold Speert and Thomas C. Peightal, Jan., 151
—sarcoma; 9 cases (ab), Stanley B. Reich, May, 795
UTRICULUS PROSTATICUS. See Müller's Duct

V

VAGINA
—roentgenography of cysts (ab), F. Szelló, March, 469
VALENTINE, WILLIAM N., CRADDOCK, CHARLES G., and LAWRENCE, JOHN S.: Effect of roentgen radiation on the production of thoracic duct lymphocytes (ab), April, 637
——See **CRADDOCK, CHARLES G.**
VAN ALLEN, WILLARD W.: Characteristics of commercial x-ray screens and films (ab), May, 792
Persistence of fluoroscopic screens (ab), May, 792
VAN DOORN, C. VAN W., and BOET, J. N.: Lacuna skull and craniofenestria (ab), Feb., 293
VAN HERIK, MARTIN, and GOOD, C. ALLEN: Comparative accuracy of the Chassard-Lapiné and recumbent positions in roentgen measurement of the pelvic outlet, March, 392
VAN ORDSTRAND, H. S. See **DeNARDI, JOSEPH M.**
VARICOSE VEINS
—new method of venography with particular reference to its use in varicose veins (ab), H. D. Moore, June, 915
VASOMOTOR SYSTEM
—vasomotor response to the intravenous administration of neo-iopax for urograms (ab), R. V. Daut and J. Hartwell Dunn, May, 789
VEINS
See also Extremities, blood supply; Varicose Veins
—anomalous right pulmonary vein entering the inferior vena cava; 2 cases diagnosed during life by angiocardiography and cardiac catheterization (ab), Charles T. Dotter, et al, June, 906
VELASQUEZ, TULIO. See **BRUCE, ROBERT A.**
VENAE CAVAE
—anomalous right pulmonary vein entering inferior vena cava; 2 cases diagnosed during life by angiocardiography and cardiac catheterization (ab), Charles T. Dotter, et al, June, 906
—obstruction of superior vena cava; review of the literature and report of 2 personal cases (ab), Floyd T. McIntire and Edwin M. Sykes, Jr., April, 619
VERCO, P. W.: Primary atypical pneumonia. Report on 14 cases observed at the Royal Adelaide Hospital (ab), Jan., 134
VERTEBRAE. See Spine
VETERANS
—rheumatoid spondylitis: observations on the incidence and response to therapy among veterans of the recent war (ab), Elam C. Toone, Jr., March, 465
VICKERS, ANTHONY A.: Bronchography. The methods by which it may be performed and the factors influencing the choice of method (ab), March, 447
VIDAL, CARLOS. See **AYRES DE SOUSA**
VIEWING BOX
—new scientific exhibit viewing boxes, C. E. Hufford, March, 435
VIEWING DESK
—stereoscopic viewing desk designed for limited space, Desmond T. Burke, May, 750
VISCERA
—fast radiological visceral survey, C. Gianturco, Jan., 59
—simultaneous association of situs inversus, coronary heart disease and hiatus hernia; report of case and review of literature (ab), Henry N. Rosenberg and I. N. Rosenberg, March, 456

VISCERA—*cont.*
—situs inversus with associated abnormalities; review of literature and report of 3 cases (ab), J. Robert Johnson, Jan., 142
VOLVULUS. See Intestines
VON SALLMANN, LUDWIG, EVANS, TITUS C., and DILLON, BEATRICE: Studies of the eye with radiosodium autographs (ab), April, 638
VORIS, HAROLD C.: Subarachnoid hemorrhage (ab), Feb., 294
VULVA
—carcinoma; 313 cases (ab), James P. Palmer, et al, March, 471

W

WAINERDI, HAROLD R. See **D'AGOSTINO, JOSEPH V.**
WALDECK, K. See **EXALTO, J.**
WALDMAN, JOSEPH, and SHANNON, C. E. G.: Retinoblastoma (retinal glioma) cured by radon seeds. Report of a case (ab), Jan., 150
WALKER, LEONARD A. See **DOBSON, ERNEST L.**
WALLACE, A. J. See **GRAY, CHARLES M.**
WALLACE, K. M. See **GREENFIELD, MAURICE M.**
WALSTAD, PAUL M. See **CARLSON, EVERETT**
WALTHARD, B., and ZUPPINGER, A.: Eosinophilic granuloma of bone (ab), June, 910
WARD, MELGIE. See **MASON, EDWARD F.**
WARD, R. OGIER: Extravesical radium therapy in cancer of the bladder (ab), Jan., 152
WARRICK, C. K.: Polyostotic fibrous dysplasia—Albright's syndrome. Review of the literature and report of four male cases, two of which were associated with precocious puberty (ab), April, 623
WARTS
—problem of plantar radiodermatitis (ab), Andrew H. Montgomery, et al, June, 926
—treatment of plantar warts by single dose method of roentgen ray (ab), J. Lewis Pipkin, et al, Feb., 309
WASSON, W. WALTER: What further contribution can radiology make to medicine? (ab), June, 919
WATTS, RANDOLPH E., and RAMER, SAMUEL M.: Jejunoileal diverticula. Review of the literature and case reports (ab), March, 461
WAUGH, JOHN M. See **McCREADY, FRED J.**
WAYNE, E. J. See **GOODWIN, J. F.**
WEBB, J. H.: Fogging of photographic film by radioactive contaminants in cardboard packaging materials (ab), March, 476
WEBSTER, J. E. See **GURDJIAN, E. S.**
WECHSLER, I. S., and GROSS, S. W.: Arteriography in cerebral vascular accidents (ab), May, 767
WEENS, H. STEPHEN, and THOMPSON, EDGAR A.: The pulmonary air meniscus, May, 700
——See **OLNICK, HERBERT M.**
WEINBREN, M.: Present status of radio-therapy and the radio-isotopes in the treatment of cancer (ab), June, 919
Treatment of cancer: a radiological analysis of Prof. J. van Roojen's report on the treatment of an experimental clinical series (ab), March, 470
WEINSTEIN, LOUIS, and FRANKLIN, WILLIAM: Pneumonia of measles (ab), May, 773
WELIN, SÖLVE. See **ENGSTRÖM, ARNE**
WENTWORTH, J. E. See **GOUGH, J.**
WERNER, SIDNEY C., QUIMBY, EDITH H., and SCHMIDT CHARLOTTE: Use of tracer doses of radioactive iodine, I^{131}, in the study of normal and disordered thyroid function in man (ab), March, 474
WEST, ESMOND F.: Intrathoracic dislocation of the humerus (ab), Jan., 146
WEXLER, DAVID J., BIRNBERG, CHARLES H., and KURZROK, LAWRENCE: Hysterogram in the diagnosis of uterine bleeding (ab), May, 789
WEYLAND, W., and MAIER, C.: Iodobil as a gall-bladder contrast medium (ab), Jan., 142
WHITCOMB, BENJAMIN B., and SCOVILLE, WILLIAM B.: Methods of marking the plane of section in the open lobotomy operation, May, 741
WHITE, CHARLES M., and ROMBOLD, CHARLES: Value of x-ray therapy in orthopedic cases (ab), June, 924
WHITE, EDWARD L. See **KOIRANSKY, HENRY G.**
WHITE, J. A.: Secondary haemangioma of bone. Report of a case (ab), June, 911
WHITEHOUSE, WALTER M. See **ISAACSON, ALVIN S.**
WIERMAN, WILLIAM H. See **HARPER, FRED R.**
WIGH, RUSSELL: Mucoceles of the fronto-ethmoidal sinuses. Analysis of roentgen criteria. Relation of frontal bone mucoceles to ethmoidal sinuses, April, 579
WILDER, T. S. See **HEALD, FELIX**
WILKINS, FRANKLIN B., ISAAC, FRANK, and OTTOMAN, RICHARD E.: The preoperative scout film of the chest (ab), May, 770
WILLIAMS, A. JUSTIN: Rheumatoid (Marie-Strümpell) spondylitis. Technique of examination and importance of the costal joints (ab), March, 465
WILLIAMS, BRYAN: A new contrast medium for hysterosalpingography (ab), June, 916
WILLIAMS, I. G.: Carcinoma of the rectum and anal canal. Treatment with very high voltage x-ray therapy (ab), March, 471
WILLIAMS, S. F. See **HODGES, PAUL C.**
WILMS' TUMOR. See Kidneys, tumors
WILNER, DANIEL. See **SWENSON, PAUL C.**
WILSON, AUDREY L. See **PIRANI, CONRAD L.**
WILSON, C. W. See **ALY, SAMIRA M.**
WILSON, FRANCIS W., and GRANGER, W. H.: Clinical aspects of prolapsed gastric mucosa (ab), March, 459
WILSON, HARRISON B. See **SNEDECOR, SPENCER T.**
WILSON, WILLIAM L. See **CUTTER, HAROLD C.**
WINDEYER, B. W.: Present position of radiotherapy in medical practice (ab), May, 798
——**and WOODYATT, P. B.:** Osteoclastoma. A study of thirty-eight cases (ab), April, 625
WINGFIELD, WILLIAM L., and TOONE, ELAM C., Jr.: Calcinosis—report of a case (ab), April, 625
WINTERNITZ, J. G. See **STEED, P. R.**
WIRTS, C. WILMER, and BRECKENRIDGE, ROBERT L.: Carcinoid tumor (argentaffinoma) of the stomach (ab), March, 460
WITTENBORG, MARTIN H.: Roentgen therapy in neuroblastoma. A review of seventy-three cases, May, 679
——See **NEUHAUSER, EDWARD B. D.**
WOLFE, H. R. I., and FRANCE, N. E.: Arteriovenous aneurysm of the great vein of Galen (ab), June, 896
WOLFE, JOHN J., and PLATT, WILLIAM R.: Postirradiation osteogenic sarcoma of the nasal bone. Report of two cases (ab), April, 637
WOOD, CONSTANCE A. P.: Some factors influencing response of cancer to radiation (ab), June, 919
WOOD, ERNEST H., Jr.: Diagnosis of spinal meningiomas and schwannomas by myelography (ab), April, 628
——**and HIMADI, GEORGE M.:** Chordomas: a roentgenologic study of sixteen cases previously unreported, May, 706
WOOD, FRANKLIN G. See **SMITH, K. SHIRLEY**
WOOD, GREGG, D. See **HOFFMAN, JOHN M.**
WOOD, JOHN P.: X-ray diagnostic file system (ab), Feb., 306
WOOD, PAUL. See **HARRISON, C. V.**
WOODYATT, P. B. See **WINDEYER, B. W.**
WOOLF, VICTOR F., and GOULD, WILBUR J.: Transitory infiltrates in the lungs with eosinophilia (Loeffler's syndrome). A review with the report of a case (ab), May, 773
WORK
—relation of the cardiac volume to the weight and surface area of the body, the blood volume and the physical capacity for work (ab), Sven R. Kjellberg, et al, Jan., 137
WRIGHT, H. PAYLING, OSBORN, S. B., and EDMONDS, LENISE G.: Measurement of the rate of venous blood-flow in the legs of women at term and in the puerperium, using radioactive sodium (ab), Jan., 138
——See **OSBORN, S. B.**
WRIGHT, JEANNE E. See **GALIHER, CLAUDIA B.**
WRIST
See also Scaphoid Bone, Carpal
—case of bilateral os triangulare carpi (ab), G. Riva, March, 467
—diagnosis and treatment of carpal injuries (ab), George Cooper, Jr., and Charles J. Frankel, June, 913
—stereoradiographic reconstruction of developing carpus (ab), R. O'Rahilly, Jan., 146
WYATT, G. B. See **NEWBOLD, H. L.**
WYCIS, HENRY T. See **LEWIN, JULIAN R.**
WYKE, B. D.: Primary hemangioma of the skull: a rare cranial tumor. Review of the literature and report of a case, with special reference to the roentgenographic appearances (ab), Feb., 293

X-Y-Z

XANTHOMATOSIS. See Lipogranulomatosis
YATES, CHARLES W. See **MORETON, ROBERT D.**
YOUNG, BARTON R. See **LEWIN, JULIAN R.**
YTTRIUM. See Radioactivity
ZAHN, DANIEL W.: Pulmonary infiltration associated with sensitivity to histoplasmin. Report of a case (ab), May, 771
ZECH, R. L.: Acute pancreatitis following cholangiography (ab), June, 910
ZIMMERMAN, IRVING, and MANN, NORMAN: Boeck's sarcoid: a case of sarcoidosis complicated by pulmonary emphysema and cor pulmonale (ab), June, 900
ZIMMERMAN, SIDNEY P.: Hyperparathyroidism—simulating Paget's disease (ab), Feb., 301
ZINC
radioactive. See Radioactivity
ZIRCONIUM. See Radioactivity
ZIVIN, SIMON. See **SPELLBERG, M. A.**
ZUPPINGER, A. See **WALTHARD, B.**